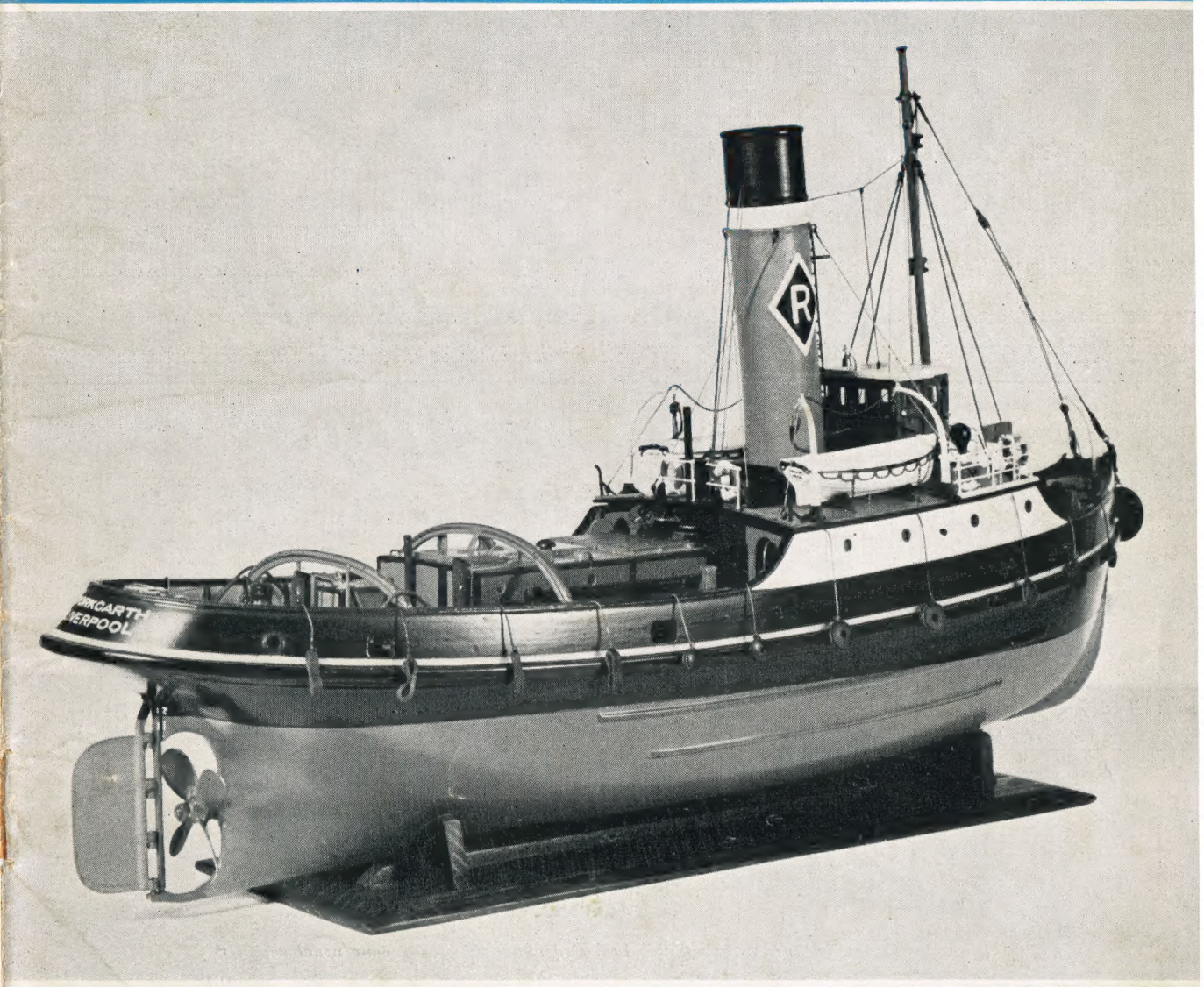
THE MODEL ENGINEER



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DESIGN AND CONSTRUCTION OF LOW POWER STEAM BOILERS
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LAUNCH ENGINE WITH MARSHALL GEAR ● READERS' LETTERS

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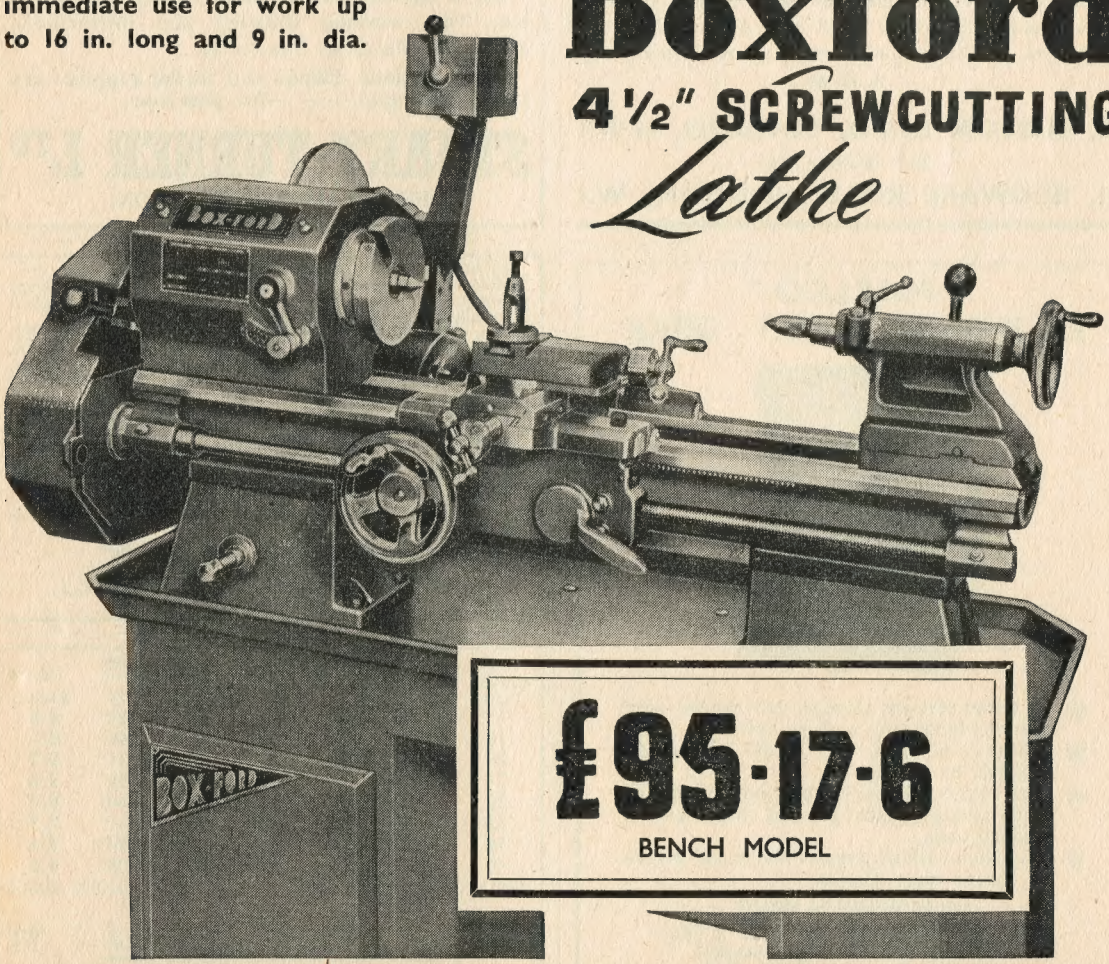

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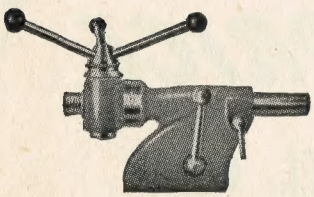

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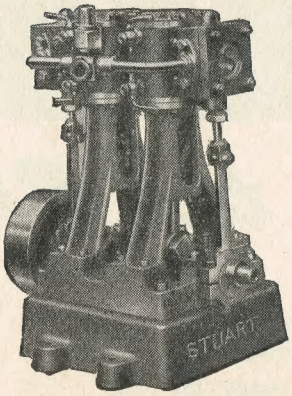

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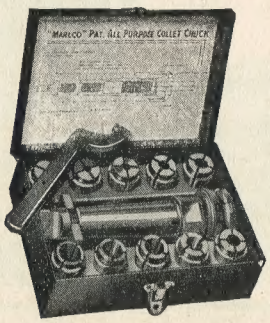

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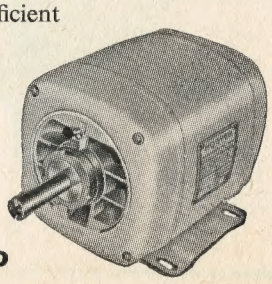

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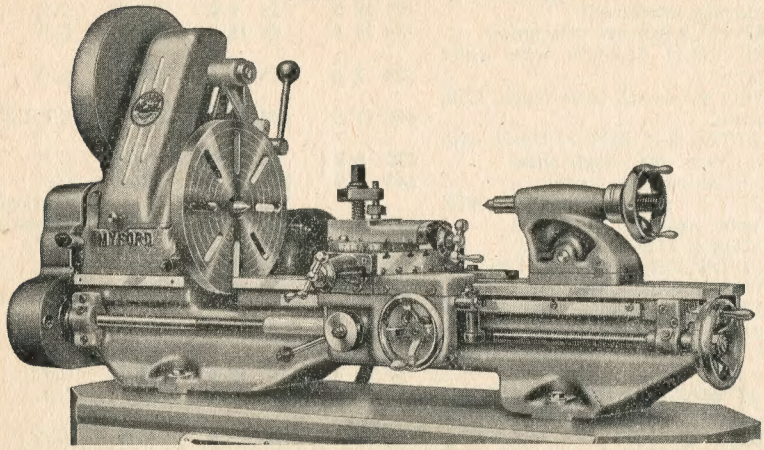

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Volume 111 · No. 2781

SEPTEMBER 9th . 1954

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Our Cover Picture

One of the most attractive ship models in the recent "Model Engineer" Exhibition, was the electrically driven tug *Yorkgarth* which was built by Mr. A. T. Judd of Birmingham. Made to the scale of 4 mm. to 1 ft. the model is only about 18 in. long, but, as will be seen from the photo, the general proportions are perfect and all the external and deck details are included. The finish is extremely good and the painting is excellent. The Silver Medal it was awarded was very well merited. The visitors to our Exhibition will remember his lovely little model coaster *Eleftheria* which won the Wellingham Cup in 1951 and was included in the display of celebrity models in the 1952 Exhibition. Both models are built to the same high standard.

SMOKE RINGS

A Royal Occasion

ALTHOUGH LAYING no claim to being an engineer of professional or even amateur status, Prince Bernhard of the Netherlands has a very keen appreciation of the skill of the engineer, and the model engineer in particular. In his speech at the opening of the MODEL ENGINEER Exhibition he stated: "The appeal of this Exhibition is almost universal, because it appeals to the future grown-up in every child and to the child in almost all of us grown-ups, but beyond the mere spectator's observations of this exhibition lies something deeper. I know that the work which model engineers put into their labours of love has a serious aspect and affords a stimulus to deeper reflection. It takes us, for a moment, right out of a world which is becoming oppressive by the gigantic dimensions of its uncontrolled, unmodelled potentialities. In a world in which the ingenuity of man has brought us to the threshold of total annihilation, you, here, are demonstrating, not so much the reverse of that same ingenuity, but certainly another and infinitely more endearing and enduring aspect of it: the love of detail and perfection.

"And there is yet another reason why this exhibition of the results of your admirable hobby seems to me to serve as an example to us all: in this world of often desparate concentration, rationalisation and mass production, you stand for what the Roman's called 'Homo Ludens' —the man who plays. Now, of course, I don't mean to say that I expect to find here a stand of octogenarians blowing soap bubbles or anything of that kind, or riding hobby horses! 'Homo Ludens' is the man who has discovered that his activities need not at all times be concentrated on economic objectives, and that the employment of his mind and hands in quite different fields may have an equal and sometimes a superior value.

"Each in his own way, as an amateur, can, therefore, discover something of the essence of life, in so many directions, whether it be in poetry, music, in painting or in writing, or in fashioning things with his own hands. Indeed, there are things which you have made with your own hands, with patience and devotion; something of the best of this world is truly reflected.

"I feel certain that all visitors to this exhibition will leave it with the conviction that, if we cannot say that all is for the best in the best of all possible worlds, at least all is of the best in the best of all exhibition of models.

"Now many of you will have spent months, perhaps years, of work in producing these models which are here on view, and whilst it certainly is not possible for you all to win prizes, I am sure that everyone will appreciate and admire the very high quality of your work. In fact, personally, I am glad that I am not going to be a judge."

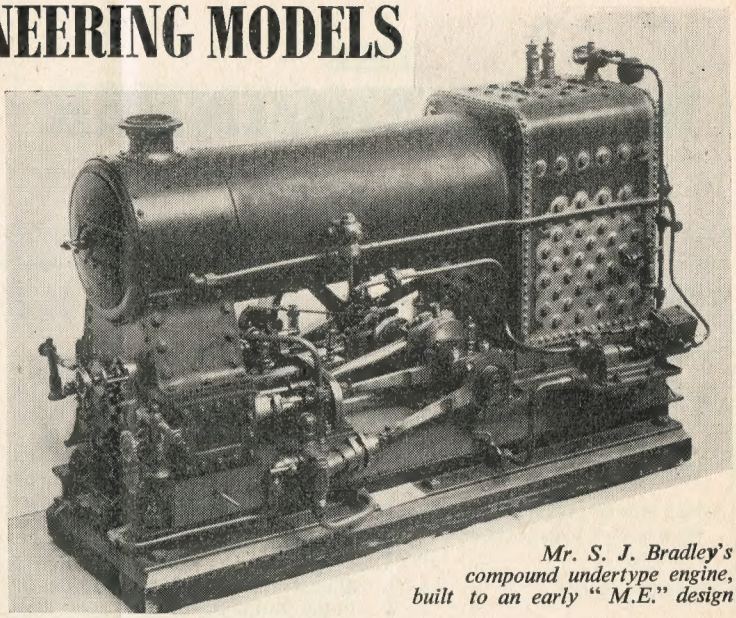
His Royal Highness is closely in touch with model making activities in Holland, and was especially interested in the fact that, in the Exhibition, there were five models from his own country. These were the work of Mr. H. J. H. Modderman and Mr. D. M. Smit, the former of whom had the honour of being presented to the Prince. The models were all in the Model Aircraft section, and were of very excellent quality; Mr. Modderman managed to win a Silver Medal, a Bronze Medal and a V.H.C. Diploma, a success which clearly shows the high standard of his work, and it should be an incentive for others of his countrymen to enter our competition in the future.

"M.E." Exhibition Prize Howler

PERPETRATED BY the visitor to the S.M.E.E. stand, who explained in great detail to a companion the intricate details of Mr. W. T. Barker's beautiful Trunk Marine Engine and stated that it was the mechanism for a Congreve clock!

GENERAL ENGINEERING MODELS AT THE "M.E." EXHIBITION

Reviewed by E. T. Westbury



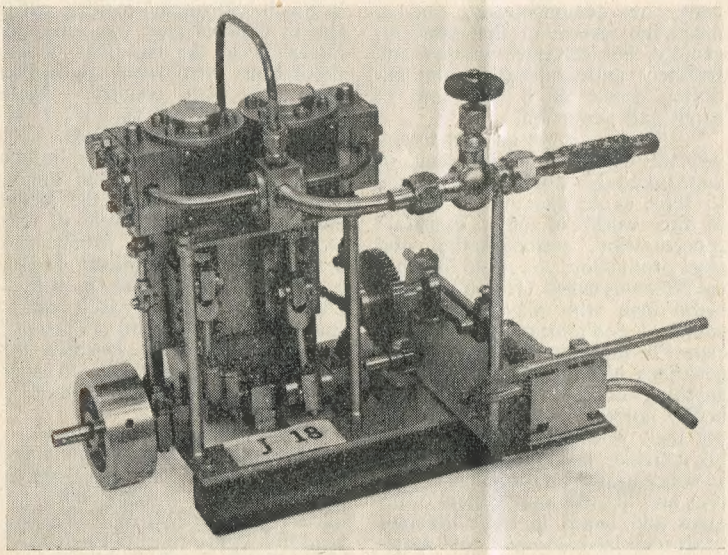
Mr. S. J. Bradley's compound undertype engine, built to an early "M.E." design

THE exhibits in this section reflect not only the continued popularity of the steam engine as a subject for model construction, but also the infinite variety which this type of engine offers in respect of design, methods of construction and application. Out of 19 entries, no fewer than 14 were steam engine models, yet no two were quite alike, and at the two extremes could be found examples of the austerely simple and the lavishly intricate. Without exception, all were well made in their essential parts, though some lacked the finish which one is entitled to expect in exhibition models; and there was a total absence of the fundamental and glaring errors which have often been seen in models exhibited in the past. It is, I trust, no unwarranted presumption to claim that the steadfast policy of THE MODEL ENGINEER and its contributors, in their efforts to guide the hand of the constructor, and to provide authentic information and illustrations on engine design, has contributed largely to the general improvement of quality.

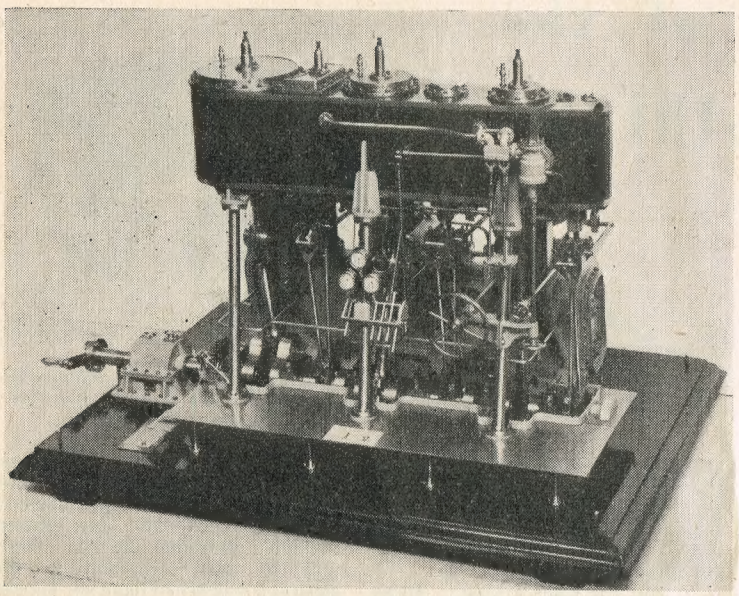
In venturing to offer candid opinion on the features of individual models, it behoves the reviewer to "tread warily." Some hard words have been said about the decisions of judges, and even more so about criticisms which have been published in THE MODEL ENGINEER. I would, therefore, anticipate possible controversy by reminding readers that honest criticism is not condemnation, and that our critics seek not to destroy, but to build up, and improve model engineering. In my experience, very few of the exhibitors of models have shown any resentment of criticism; on the other hand, many of them have actually asked for a frank opinion of the merits of their models, and have welcomed either privately or publicly expressed advice on the matter. Most of the protests are raised by non-exhibitors who tell us that "they would not dream of entering a model in the Exhibition to have it torn to pieces by the critics." This attitude, I suggest, is somewhat like that of a cricketer who refuses to take part in a match, in case he might be "out for a duck."

In all competitions, there must necessarily be losers as well as winners, and no ignominy is attached to honourable defeat; but surely a loser need not resent honest advice as to *why* he lost, with a view to avoiding defeat in future?

The reappearance of a very interesting type of engine, once popular, but absent from the Exhibition for many years, was heartily welcomed, and one hopes that its resurrection is not a mere flash in the pan. I refer to the two examples of Undertype engines, by Messrs. J. E. Kelly,



A twin-cylinder engine for a steam yacht, by Mr. R. J. Frostick



The 1 in. scale triple expansion marine engine by Mr. E. B. Wilcox, winner of the Championship Cup in the General Engineering Section

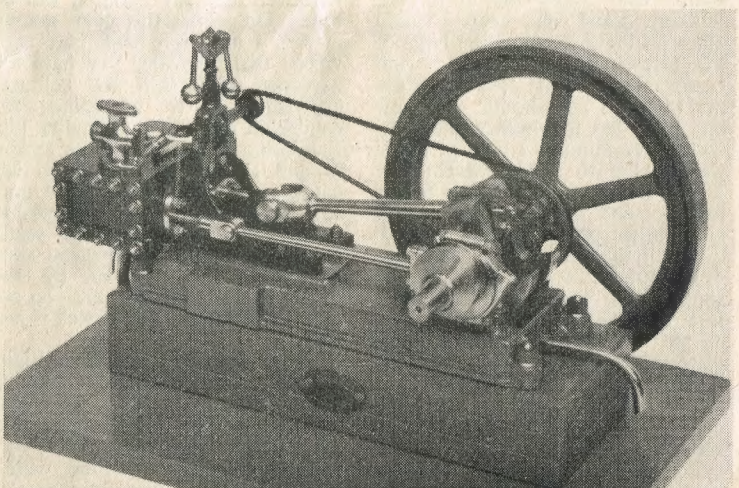
of Chatham, and S. J. Bradley, of Radcliffe-on-Trent, respectively. This type of engine was once very popular for light industrial duties, where a compact, self-contained plant was desirable, though very few full-size examples now exist, and the value of good models to keep their memory alive is beyond question. The first-mentioned model was apparently a free-lance design, and was very well made and finished, including the paint work; but the other, although showing some excellent workmanship in both engine and boiler, including neat riveting and caulking, had accumulated much tarnish, dust and discoloured oil which detracted much from its appearance. Both engines were equipped with feed pumps, the former having a neat vertical duplex pump, and the latter a Stuart direct-acting horizontal pump. Among the horizontal stationary engines, the exhibit by Messrs. Kent and Tapper of a Tangye "Salvage" engine came well up to the standard of previous exhibits by these constructors, which have always been distinguished for their meticulous accuracy and just-right finish. Mr. Rendall's agricultural type engine was of great interest in view of the source of information on its design, namely Bourne's *Catechism of the Steam Engine*, and the fidelity with which this had been copied; the finish of this model was not its strong point, but was probably in keeping with the prototype, designed for rough usage under conditions far from ideal in respect of care and maintenance. The "Unicorn" engine by Mr. W. Jennings, though calling for no description, deserves honourable mention as a workmanlike interpretation of a popular "M.E." design; personally, I should have liked it better if it had been complete with feed pump, which apart from its usefulness, does undoubtedly put the finishing touch on the appearance of an engine of this type.

Early steam engine history was worthily represented by Mr. C. H. Toogood's model of the Trevithick steam engine and boiler, one of the first attempts to employ high pressure steam to good advantage. It was finished all over in the semi-matt black which has come to be accepted as correct for early historical engines, but I have never been quite convinced that this should be so. The early engines which we see in museums have usually been rescued after a long and arduous career, plus many years on the scrap heap, exposed to the elements, and no doubt the best finish which could be given to them in the circumstances is to paint them all over; but from what I have learned of early engineering craftsmen, I believe that when they built these engines, they lavished as much loving care on the finish of the working parts as on the design. If I am wrong on this point, no doubt there are many better-informed readers who will correct me.

Another historic type of engine was the Easton and Amos "Grasshopper" by Mr. K. W. Harris; this design, published some years ago in THE MODEL ENGINEER, has inspired several constructors, and it may be remembered that one was exhibited last year. A smaller grasshopper beam engine was entered in the Students' Cup Competition, by the Cuckoo Hall Secondary Modern School.

"Everything but the smell" was featured in the engine room exhibited by Mr. H. F. Spurr, which included two horizontal Corliss

(*Continued on page* 303)



An example of the "Unicorn" mill engine by Mr. W. Jennings

Impressions of the "MODEL ENGINEER" EXHIBITION

School boys send a breath of Somerset to the Horticultural Hall, with their Rossiter farm wagon

By L. H. Sparey

TO write one's impressions of the "Model Engineer" Exhibition is always extremely difficult. Were it necessary to describe only the models, or the trade stands, the thing would be easy. But the "Model Engineer" Exhibition is neither of these things, though they are really what we are supposed to come to see. Yet I doubt if any visitor on leaving the hall has any clear-cut picture in his mind. Rather does he carry away a somewhat confused impression of sights and sounds, of models and stands, of persons and personalities.

Only an hour ago I was in the Exhibition Hall, amid the lights and the bustle, and now I sit alone with my typewriter—with a strict deadline set by the editor—and some sheets of blank paper, and a vista of midnight oil. Yet, perversely, I cannot think of the models, nor of the trade stands, but only of the visitor who asked me in a soft, southern drawl what value I would place on the 2-in. precision lathe of Mr. Fowkes and Mr. Turner. And I remember how I tried to reduce the thing to man-hours, and how one thing led to another, and how within five minutes I learned that I was talking to a Mr. McEvoy of Texas, U.S.A., and how his family fortunes had been founded by his grandfather on patents in the oil-drilling industry. And I heard also of his grandfather's friend, who went south in the 'forties and acquired a tract of Texas land in exchange for an old white horse, and of how the discovery of oil netted him 8,000,000 dollars. Alas! that such opportunities do not exist in this old country. Why, I haven't even an old white horse!

Mr. McEvoy is now returning to the States—the quick way via the continent of Europe—and I doubt that I shall ever meet him again in this world or the next, in spite of his urgent invitation to call when I am down his way. Yet, I shall, I fear, remember my oil-man from Texas when most of the models are forgotten.

So you see what I mean. Texas and the romance of the west in the middle of the Horticultural Hall; yet, indeed, all part of our exhibition, and just the sort of thing that we expect. But, tempted as I am to turn this article into My Impressions of the Visitors to the "Model Engineer" Exhibition (what fun I could have!) the exhibits must claim my attention, and, I confess, without much difficulty. For this year we have some of the best in the land. What am I to say about Mr. H. Powell's 2-in. scale model of a L.N.W.R. 2-2-2 *Lady of the Lake*? Doubtless this engine will be described in detail by writers more qualified than I, but believe me, whatever they say about it will be true. On seeing this giant among models I am more and more convinced that, provided you have the necessary high skill and courage, everything is to be gained for exhibition purposes by building big. Exhibition models are to be looked at, and it is the imposing model that catches the eye, whatever we may say about it. Do you remember the large roundabout at last year's exhibition? But before you start ordering your material by the hundredweight be sure that you are a real craftsman. Mr. Powell is just that.

There are two classes of exhibits which, each year with unfailing regularity, scare me stiff. The clocks and the ships. For finish and presentation they are to me the aristocrats of the modelling world, and as a very common commoner I approach them with due humility. To pick out for special mention any of the clocks exhibited this year would be an injustice to all the others, and I make note of Mr. Warren's Skeleton Clock, and Mr. Ramsbotham's Semi-free Balance Clock, only to draw attention to the general excellence of them all. Clocks are one of the things that I always go especially to see, and one day, when I have grown up a little, I intend to make one. But you will never see it at your exhibition. I dare not risk not winning the first prize.

And as I wander along the aisles, there before my eyes is our link with Mr. McEvoy and the wild and woolly west—the full-scale working models of a Walker-Colt .375 revolver of 1846, and a Colt Revolver .45, of 1873, without which our cowboy films would be impossible. I am a man of peace, but their wicked, black deadliness fascinated me. One day, if ever I am in Bristol, I shall call on Mr. Bywaters and persuade him to let me fire a few rounds. And the thought strikes me that it was, perhaps, with such a weapon as these that our grandfather's friend arranged the deal over his old white horse.

It seems to me that I suffer from a too unruly an imagination, and that the impressions which our exhibition makes upon me range too far beyond the walls of the Horticultural Hall. I am, for instance at this very moment, in a lane in Somerset, atop a load of hay on the Rossiter Farm Wagon, made by the boys of the Crewkerne Secondary Modern School, and I can smell again a countryside that I love. Thank you, schoolboys, for a memory from which I have been too long divorced. I liked your model farm wagon because the wheels looked as if they would really squeak. . . .

From the wagon to the ploughed field was but a step, and I am with

Mr. R. W. Palmer's pair of Fowler ploughing engines, turning up the black earth for the gulls to glean. But not for long, for my attention is quickly drawn to a practical consideration of the wealth of fine detail which these models display. It is difficult to imagine, at first glance, that these engines are not actually working models, because all the motion mechanism seems to perform in fine style. It struck me that very little more work would have been necessary to really make these into working models.

It was at this point that I met a disembodied spirit—Mr. H. E. White track superintendent of the S.M.E.E.

I said: " What's the matter, Bert?"

He said: " No track."

So very gently, and with the minimum of persuasion, I led him to the bar, where, over one, or two, or possibly three, glasses, we discussed the *great omission.*

Seriously though, and judging from the comments which I was particularly careful to gather, this was a mistake which must not be repeated. Not only the old hands, upon whom the very existence of model engineering depends, but even little Willie and his father, spending an afternoon of the school holidays, missed the bustle, the life, the clatter and smell of the railway. A locomotive in a glass case is a poor thing compared with an engine under steam. Why the track, which has never shown signs of losing popularity, was omitted, I do not know. Possibly it was thought that it was too permanent a feature, of which the public was becoming tired. This, I feel, would have been a very mistaken idea. The passenger-carrying track was, in fact, the only thing in the whole exhibition in which the public, both general and specialised, could really participate.

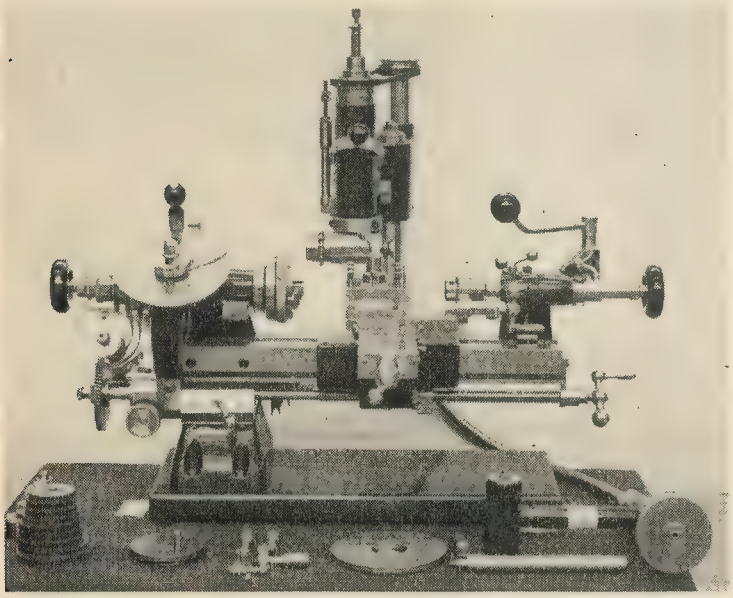
And there is to me, another and more serious aspect. To those of us who have, year after year, visited, exhibited our models, and contributed in no small measure to the success of the " Model Engineer " Exhibition, the S.M.E.E. track has become a symbol, an embodiment of the spirit of model engineering. And this year a little of this spirit has been lost—and a loss of spirit is as bad for exhibitions as it is for men.

On re-entering the hall all the lights had been miraculously brightened; all the models had, quite unaccountably, been repolished, and even, in some cases I believe, re-painted, and there was a general air of gaiety and light-heartedness which had been unnoticeable an hour before. Or maybe, on second thoughts, things may only have seemed a little different. No matter, I was soon once more pursuing my way, unhampered this year by the responsibilities of a judge, and free to enjoy my models without having to discover the inevitable fault. And so I was halted by the ¼ scale model of Macmillan's bicycle, of about 1840, the first adaptation of crank drive to the " hobby-horse," and the real foundation of the gigantic cycle industry. This machine was remarkable for having all the essential characteristics of the modern bicycle, and Macmillan, that gallant Scotsman, frequently rode his machine to market, from Courthill to Dumfries, some fourteen miles, even " keeping pace with farmers in gigs." He was, on one occasion, fined for knocking down a child, so that we may credit him with inventing not only the bicycle, but also our modern traffic problems. This latter invention has, like most others, been greatly improved by modern developments. Mr. R. E. Brooke's model does appear to be a fairly true representation of Macmillan's original bicycle, but seems to have become entangled somewhat with the " Bone-shaker " which was in popular favour in the sixties. Nevertheless, I thank Mr. Brooks for reminding me of an almost forgotten genius.

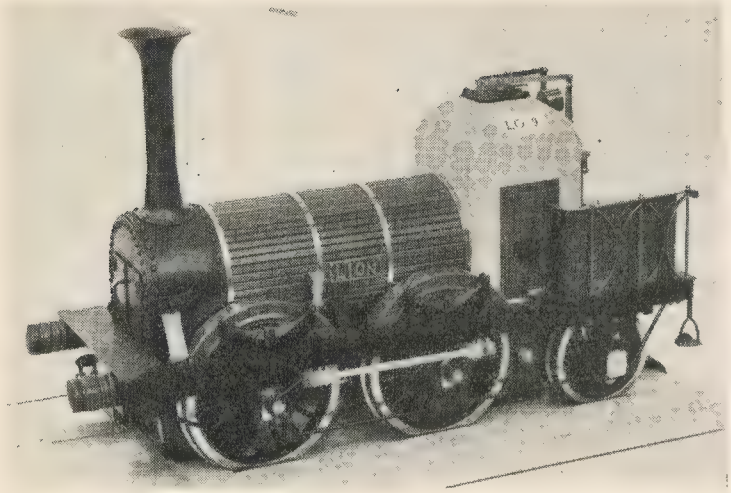
The hand-powered Jib Crane exhibited by Mr. G. L. Bath of Caterham was remarkable to me for one singular fact. In all my model engineering years I have never before met a model in which the paintwork has, quite accidently, made many of the metal parts look like wood ! Many and many a time have I seen wood painted to appear as metal—never successfully, however—and now, behold, we have the reverse. To be candid, the whole of this model was completely spoiled by the paintwork. If Mr. Bath will only repaint it in the proper manner he will have a model worth looking at.

This leads me to the group of five miniature stringed Musical Instruments, by Mr. V. H. Washer of London, an exhibit which might well be labelled " Beware the Dangers of Gold Paint." This little collection set out originally to be a very charming group, until, presto ! The whole thing is ruined by the gold paint on the harp. I have never yet seen a model—save in very exceptional cases, such as fairground models where gold paint is actually used in the prototype—that could stand the application.

Just as the theatre-goer follows his favourite actors, and the cinema addict his favourite stars, so do I also look for the products of my own star performers in the model world. And there, sure enough, is the " Salvage " steam engine, of Mr. A. J. Kent and Mr. F. H.



This is the sort of thing that made the judging for the Duke of Edinburgh Trophy such a difficult business. This 2 in. precision lathe by Messrs. Fowkes and Turner seems to have every worthwhile accessory known and unknown



Mr. L. B. Parkin's "Lion" locomotive reminds us that even "old" engines were new once upon a time

Tapper of Smethwick, those joint craftsmen who never disappoint me. Here, again, it is not my function to describe the model in detail, but only to give my impressions of it. Last year I did, I fear, make some rather uncharitable remarks about the imitation tiled flooring of their table engine, but this year they have been determined not to give that bloke Sparey any chance whatever. Their wooden-plank flooring on this "Salvage" engine is just perfect, and if you did not notice it then you missed a treat. As for the engine itself, it need only be said that it is well up to the Kent-Tapper standard. What this standard is will be appreciated when I say that last year their table engine was one of the few models that the judges found impossible to fault.

The section devoted to workshop appliances and tools has, I think, a lesson to teach us this year. Several very beautiful lathes were on show, notably the 2½-in. instrument lathe by C. W. Tidy of Sutton, and the 1½-in. centre lathe by T. E. Featherstone of Hunton. On the several examples of lathes exhibited it was a noticeable fact that in almost every case some dividing mechanism had been incorporated in the machine. Obviously, if you are designing your own lathe, you give to it those features which you find most desirable, and the fact that builders from widely separated parts of the country incorporate an identical and unusual feature surely indicates that it is something for which there is a great need. Yet few, if any, proprietary machines have any integral dividing attachments. Might I suggest that our lathe manufacturers take a look round sometime? The universal, Turpin type, dividing head by R. S. Shute also seems to emphasise this amateur need.

When we come to models of real old-time engines I must admit that I am touched on one of my weaker spots, so that I needed but little persuasion to find Mr. C. H. Toogood's "Trevithick Steam Engine and Boiler" delightful. I have, however, a curious preference for my old engines to really look old, and I was rather disappointed that Mr. Toogood presented his model in mint condition; just, in fact, as it would have looked when straight from the works. Mr. E. T. Westbury did point out to me that there was no earthly reason why an old-time engine model should not appear as when newly born, and I must admit that I could find no arguments with which to combat his logic. In any case, I gave up arguing with Westbury years ago. Being on the losing side can get monotonous. So I conceded him the point, but went away still wishing that Mr. Toogood had made his engine to look a hundred years older. I have the same illogical criticism for Mr. L. B. Parkin's 0-4-2 "Lion" locomotive, although his very fine workmanship almost overcame my prejudice.

It was about this time that I met Mr. K. N. Harris, looking just a little worried. And no wonder, for his was the task of judging the entries in the Duke of Edinburgh Challenge Cup competition. All these models occupied a separate stand, and a very imposing and fine array they made. How one was to assess, however, the relative merits of a suit of armour, a 2 in. centre precision lathe, a scale model of H.M.S. *Prince* of 1670 A.D., to say nothing of a G.W.R. "King" class locomotive, with the *Cutty Sark* thrown in for good measure, was more than I could tell him, or he tell me.

I am not generally in love with what I call "stunt" models; that is, models that depend on some novelty for their attraction. Into this category I place those models usually labelled: "the smallest this, or the smallest that in the world." Yet this year I was quite taken with Mr. W. C. Gay's working model whale gun, claimed to be the smallest of its kind. I can quite believe it. What havoc it could do in a minnow pond. The little model is quite delightful, and I am lost in admiration not only for Mr. Gay's skill, but for his original choice of prototype. How does one ever first conceive the idea of making the smallest whale gun in the world? It would never occur to me in a thousand years. Perhaps, when one sets out to make the smallest of anything, it is an advantage to chose something no one else is likely to think of. Look out next year for my smallest working model of an Eskimo's toothpick.

Another stunt model that I should doubtless have admired could I have got near it, was the large glass bottle enclosing a model naval officer working a lathe. But the throng of press photographers was too much for me. From my poor vantage point it did appear that the quality of the imprisoned artisan was somewhat difficult to assess owing to the uneven surface of the glass bottle, but I think it was pretty evident how the trick had been done.

My observations on the ship models are utterly useless, simply because all of them look perfect to me, and I know that this cannot be so. Only an expert can know whether a rope should have a right- or left-handed hitch. I did notice, however, the terrible tangle of ropes on the deck of the brig, by Mr. C. M. Hill of Gravesend. Gravesend sounds a little nautical to me, so doubtless Mr. Hill is perfectly correct, but I should have thought that half the crew would have been lost overboard by tripping on the ropes.

Two more models only can I mention, for my blank sheets of paper are becoming filled, and my clock indicates the early hours. The model of a corvette in dry dock at Portsmouth, by Mr. Crudass, was alone worth the entrance money, and could have provided an hour's

entertainment, so great was the detail. In spite of its small size, for such an undertaking, the model looked absolutely real. This, I feel, can be the one final test of excellence for a model of this kind, and it is the most difficult thing in the world to achieve.

The other model which was worth seeing was the representation of the first flight at Kitty Hawk by the Wright Brothers in 1903. I cannot say that this representation, by Mr. H. J. H. Modderman of Holland, had quite the convincing quality of Mr. Crudass, yet it appealed to me because it conveyed perfectly that unbelievable quality of loneliness which I always think is the most remarkable feature of this historic event. Ignored by press and public alike, here, in this out-of-the-way part of the world, was achieved something that has altered the destiny of mankind. Mr. Modderman's rolling sand dunes, his half-dozen almost pitiable little figures, and his fine representation of the world's first aeroplane, makes a picture which reaches far beyond the walls of the Exhibition hall—because it stretches to the furthest corners of the world.

My impressions of the trade stands are always mixed, being compounded of desires and frustrations, while by my side stalks relentlessly a shadowy figure—the ghost of my bank manager. This year, I almost welcome his chilly company, for there are so many things to tempt my purse. But I have for once brushed aside his restraining arm, and have ordered for myself what I consider to be one of the most interesting things in the show. A screwcutting gearbox for my Myford lathe. I am particularly attracted to this because I have myself designed and made a gearbox for my own machine, and I know the difficulties which are presented. My own gearbox is completely successful, and I have really no need for another, but I am tempted, beyond resisting, by its smooth, neat efficiency.

GENERAL ENGINEERING MODELS AT THE "M.E." EXHIBITION

(*Continued from page* 299)

engines, and a host of auxiliary plant, rope-driven lineshafts, pipework, etc. Representing the plant of a large refrigeration works, the general effect was quite authentic; but in comparison with other mechanical models, detail and finish left a good deal to be desired.

Exhibition reviews have often called attention, on the other hand, to the undesirability of too high a finish, and an example of this extreme appeared in the 2-stage marine steam turbine by Mr. E. Byrne, which suffered greatly from glaring brightness of the external working parts and the mirror-like baseplate. As an unusual and ingenious experimental model, this exhibit deserves high praise, and I would like to see more models showing original thought; but it is impossible on the strength of such information as can be obtained from inspection of accessible parts, to express any opinion as to the practical merits of the design. However, I can at least say that the constructor deserves commendation for the double helical reduction gearing, though its arrangement of bearings and casing is presumably temporary, and for demonstration purposes only. Perhaps it may be possible to obtain some detailed information on this model in due course.

Among the steam engines which may be described as in the purely "utility" class, the little twin-cylinder double-acting engine by Mr. R. J. Frostick, was of interest, and would probably give a good account of itself in the steam yacht for which it is presumably intended; but considered purely as an exhibition model, neither the quantity of work nor the detail quality was sufficient to give it a very high place. This applies also to the "Cygnet" twin by Mr. W. D. Urwick; the external appearance of the latter, however, indicated very clean and careful workmanship, what there was of it.

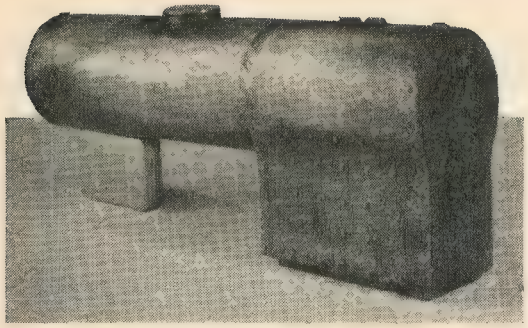
Few exhibitions are complete without one or two examples of the popular Stuart Turner designs, and on this occasion a very workmanlike specimen of the No. 7a vertical, fitted with link reversing gear, was shown by Mr. C. F. Cox, also a No. 4 vertical by a blind ex-service man, Mr. Chamberlain, the latter being a remarkable proof of how determination will triumph over disability.

A very interesting exhibit was the 3-kilowatt electrode boiler by Mr. L. E. Tovey; this bore a nameplate of Messrs. Bastian and Allen, who make large boilers of this type, and was presumably a working model of one of these. In cases where a handy and automatic source of steam for testing, or for industrial use, is required, these boilers have much to commend them, and their thermo-electrical efficiency is very high; model engineers who wish to run steam engines without the fuss and bother of coal fires or blowlamps would do well to bear them in mind.

I am always pleased to see working models of cranes, and the example by Mr. G. L. Bath interested me greatly; the workmanship and finish of the crane itself, and also the accompanying rolling stock, were quite in character, but I should have liked it better if it had been driven by steam instead of by hand.

From the earliest date on which any information on the entries in the General Engineering section were available, one could hardly avoid the conclusion that the triple-expansion marine engine by Mr. E. B. Wilcox would earn high distinction; this engine has been described in the issue of THE MODEL ENGINEER dated March 18th, 1954, and there was very little doubt that it was of outstanding merit. Engines of this type, by reason of their multiplicity of fully visible working parts, are invariably of great interest, and on the quantity of work alone, are almost certain to score fairly high marks; but by the very same token, the meticulous care and patience required in the design, construction and finish of every single part, to satisfy "them pernickety judges" as Artemus Ward said, puts them right out of the reach of those constructors who are in a hurry to see results.

I have a very weak spot for models of "real" marine engines, in view of a fairly close—sometimes *too* close !—association with them in my younger days, and I cherish a photograph of myself (self-taken by flashlight powder and touch-paper), standing at the controls of a triple-expansion engine something like that by Mr. Wilcox, but of higher power. As a result, I was pleased to see that this model obtained the award which I was convinced that it deserved. But here I am, reminiscing again—it is time I concluded this review and made way for some really informative articles !



A 5-in. gauge locomotive boiler to "M.E." design. Building time, 39 hours. Riveted and silver-soldered construction; firebox seams riveted and brazed

Small Power Steam Boilers

NOTES ON THEIR DESIGN AND CONSTRUCTION

By "Gasbag"

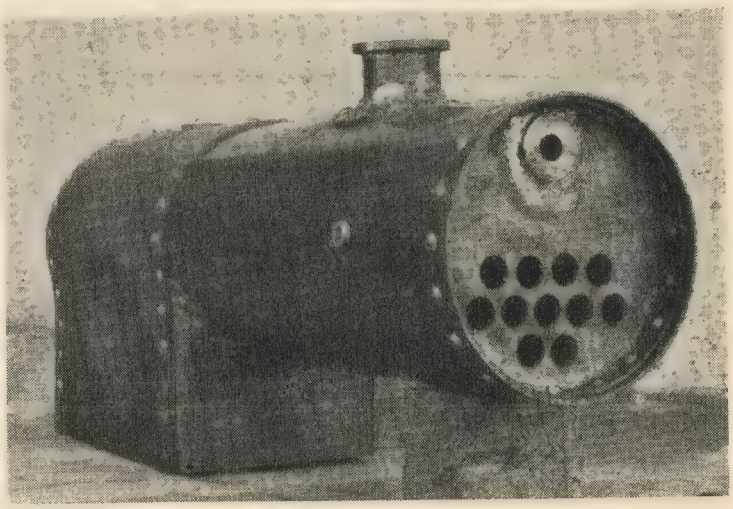
THE construction, but not the design of small boilers for model locomotives up to 1-in. scale, and traction engines of 1½-in. scale, has been very fully dealt with over the years. With the exception of an excellent, but rather out-of-date "M.E." hand-book by E. L. Pearce, and some references in some of his books by the late Henry Greenly, little or no data has ever been published on the subject of what may be termed the small power boiler. Sticking bits of 13- and 16-s.w.g. copper together with a few rivets and brazing up the lot does not constitute boiler-making, and though, by following published designs, a boiler for a small model may be produced which will give satisfaction, where the boiler is of a larger size, and has to pass a boiler insurance test, other means must be adopted.

Data on boiler design is available in standard engineering text books, but these do not as a rule go lower than $\frac{5}{16}$-in. or $\frac{3}{8}$-in. plate and $\frac{7}{16}$-in. or ½-in. rivets. The number of boilers of one type or another constructed by myself over the years now runs into three figures, and for my own guidance, I have evolved certain "home-made" formulas, which I now pass on for what they are worth. In order that a boiler may secure acceptance by a boiler insurance company, it is a desideratum that their surveyor can, from the boiler's construction, calculate the factor of safety and to authorise the pressure at which it may be worked. To this end, it is required that the boiler is of flanged and riveted construction and stayed in an adequate manner; also, that plates of correct thickness are used. Certain pressure vessels, where load is static, may be of welded construction, but insurance companies are very chary of small boilers of welded construction; this would include brazing.

From the foregoing, it must not be inferred that welding finds no place in boiler work. Welding in the firebox is the only thing which still keeps certain threshing and ploughing engines upon the road. The "Merchant Navy" class engines of the Southern Railway Company and certain American and other overseas railways have adopted the welded boiler; but elaborate steps are taken to insure good welds, and in one case, at least, the whole boiler is normalised after welding. It therefore behoves the constructor to adopt a method which will insure a ready acceptance by a boiler insurance company.

In boiler design, it is usual to work, for small and medium boilers, upon a factor of safety of 6 to 8; that is to say, if the boiler is to work at 100 lb. pressure, it would require 600 to 800 lb. to rupture some part of it. Many years ago, in 1908 to be exact, the boiler of a Rhymney Railway 0-6-2 tank engine burst in Cardiff shed, due to maladjustment of the safety valves by a fitter. It was found that a pressure of 600 lb. had been raised before the boiler burst. As the working pressure was 160 lb. and the boiler was some years old it is probable that certain grooving or wastage of the plates had taken place in the interim.

To return, let us first take our boiler shell plate and suppose we have a piece of solid-drawn copper tube ¼ in. thick in the walls by 10 in. internal diameter. For copper we may assume a tensile strength of 25,000 lb. per sq. in.; for steel 35,000 to 40,000, and bronze 40,000 to 50,000. Now taking the 10-in. tube at a pressure of 100 lb. per sq. in., we have on one linear inch 1,000 lb. tending to tear apart two pieces of copper ¼ in. by 1 in., or



A half full-size model Sand\Hutton Ry. 18-in. gauge locomotive boiler, partly assembled

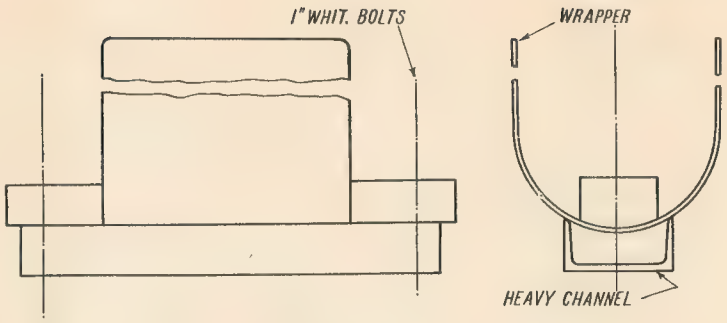
½ sq. in., viz.: 12,500 lb., or a factor of safety of 12. We can, therefore safely work this at a pressure higher than 100 lb., or use a thinner wall thickness to maintain a factor of 8; in actual fact, around 5/32 in. or $\frac{3}{16}$ in. would suit.

From the foregoing, therefore, we may arrive at our outer and inner firebox wrapper thickness, which will be that of the barrel. Should the boiler shell be rolled up from plate, however, and single-rivet lap-jointed, only 55 to 60 per cent. of this strength can be allowed. If double-riveted with a butt-strap inside and out, then 75 per cent. may be allowed. Therefore, for a given plate thickness, a shell from drawn tube steel or copper can be thinner than one rolled up from plate. This takes no account of any brazing or welding of the seam after riveting. The backplate and firebox door sheet, also tube plates, should be of a thicker plate than shell or wrapper, say ¼ in. with $\frac{5}{16}$-in. plates and $\frac{5}{16}$ in. with ¼ in.

To find data on riveted joints, and the formula, one has only to look in any text book; *Machinery's Handbook* or *Fowler's* are examples. However, for the class of work under consideration Greenly gave the following, which I have used for many years: Diameter of rivet to be one-and-a-half times shell plate thickness; pitch of rivet to be three diameters; thus, on ¼-in. plate, ⅜-in. rivets pitched at 1 in. or 1⅛ in. centres will meet the case. No rivet hole should be nearer to the plate edge that one-and-a-half times diameter.

Before the actual construction of the boiler, there is the matter of stays. Unlike the Cornish or vertical types of boiler, the locomotive type is a very weak affair if devoid of its stays. The firebox crown, and also sides may be stayed by rod stays whose total cross-sectional area will be such as to support those surfaces with the required factor of safety. In the matter of the longitudinal stays, some support is afforded to the front tube plate by the tubes in a locomotive boiler; and, in addition, some tubes may be stay tubes, that is screwed into firebox and beaded over in smokebox. If the 10-in. boiler shell in question were stayed to resist the full pressure as by treating the front tubeplate as a disc subject to pressure, a great many stays would be required.

In the case of some small locomotives, stays are here dispensed with and stout angles fitted across the plate. This was also done by Marshalls on their tractions and rollers, Wallis and Steevens using the same arrangement on "The Advance" roller, but with the addition of rod stays also. In some cases, Burrells fitted three 1½-in. dia. stays double-nutted through the boiler of some of their engines, and also a palm stay fitted from shell to firebox. The use of palm stays fitted from back and front tube-plates also finds use in locomotive work, one example which comes to mind being H. A. Ivatt's G.N.R. Atlantic 990, *Henry Oakley*.

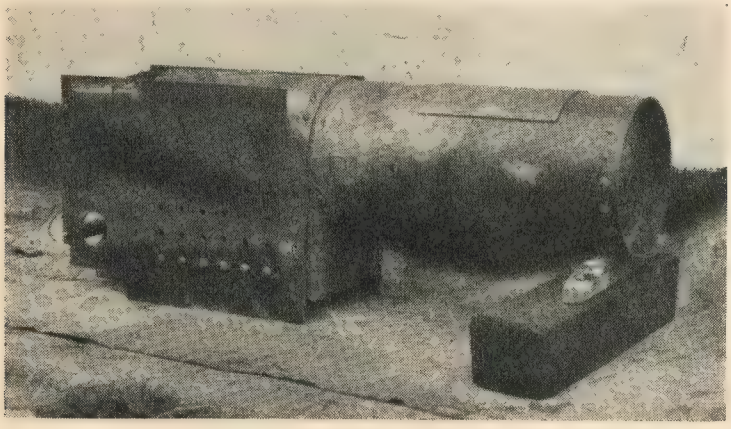


Rolling wrapper

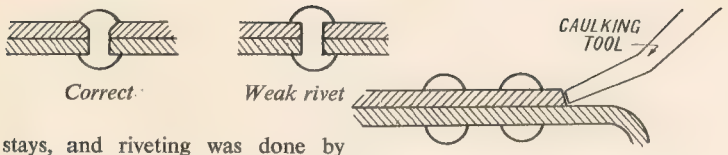
Perhaps I may be permitted to quote Prof. W. E. Dalby on these stays: "They are not actually stays, but rather sentinels whose duty it is to stand by in case anything goes wrong, therefore, a lower factor of safety may be allowed." Very many years ago, D. K. Clark made some experiments at Fairbairn's works with stays fitted from a copper box to a Lowmoor iron wrapper, and found the following: Percentage of stay support, when tested to destruction, plain screwed stay, 50 per cent. Ditto riveted over in both plates, 75 per cent. Ditto screwed and nutted on both plates, 85 per cent. In all cases, the stay was ⅝ in. diameter by 11 t.p.i. of steel.

Perhaps, most readers are aware of the corrugated firebox of the Richard Garrett Engineering Co., this was, however, in use some years before they took it up, adapted for locomotive work on the Austrian State Rlys. While still upon the subject of stays, it must be borne in mind that plate thickness enters into the question; for instance, it would be quite in order to stay, say, 8 sq. in. with two ⅝ in. stays in ¼-in. plate, but to do so in 13-s.w.g. would result in the plate assuming the shape of one of the old Great Eastern first-class carriage seats if subjected to any pressure. It is, therefore, assumed that the would-be builder has a good enough "engineering eye" to avoid these pitfalls.

Now to construction: I served my apprenticeship in the works of a small railway company where boiler work was mainly done by hand, even copper door and tube sheets being knocked up on the slab by gangs armed with large wooden mallets. Drilling and tapping for



A 4-in. scale road locomotive boiler



Correct *Weak rivet* *Caulking*

stays, and riveting was done by power; but all else was hand-work, other than the drilling of plates, rolling and plate edge planing. When these boilers were completed they were excellent examples of craftmanship, and should be an object-lesson to those people who talk of it yet require to be surrounded by twist drill grinders, micrometer indexes, dial gauges, to do the simplest job.

To enable readers to form some idea, it may be useful if I outline this work as then carried out, over thirty years ago. There were only three classes of engines, and one service locomotive in use upon the line. Templates for all boiler-plates were existing. From these, the new boiler plates were marked off for drilling; in the case of shell plates, drilling was done after rolling. Prior to any assembly, all plate edges were planed upon a plate edge planer to an angle of 80 deg., in order that the plates, when riveted, were more easily caulked. Caulking is the closing of one plate upon another after the joint has been formed, the thinner plate being caulked upon the thicker. Riveting was performed by air-operated tools, but caulking was always done by hand, as power tools tended to spread the joint. The shell, back-plate and wrapper being built up as a single unit upside down, the copper firebox was entered and located by foundation ring and firehole.

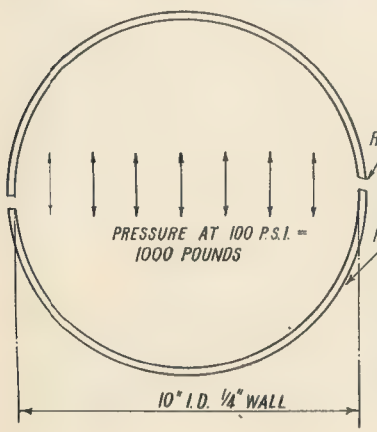
The boiler was then turned right way up for staying. This was by far the most tedious and expensive job of all; side stays of copper were $\frac{7}{8}$ in. diameter by 11-t.p.i. and roof stays of steel $1\frac{1}{4}$ in. and $1\frac{1}{8}$ in. by 11-t.p.i. Tubing with steel tubes was the last operation before handing the boiler over to fitters for insertion of steam pipe, regulator, etc. Several years later, when upon another railway, I came in contact with the method of arc-welding the riveted joint to form a seal in lieu of the expensive hand-caulking. This welding also cut out all plate edge planing, except in connection with the copper firebox, and its plates. When, therefore, I first built a small power boiler, it was decided to follow full-size practice in all respects, save the arc-welding of the joint. Here in the case of copper boilers the caulking by a large oxy-acetelyne torch and a low grade silver-solder was used.

In the case of steel boilers the same procedure has been adopted, except that "Sifbronze" (a hand-caulked steel boiler will also take-up by rusting) is used. In the actual making of the boiler, I have, in most cases, used drawn tube; but in the few instances where the shell has been rolled up from plate, "creep" rolling has been used. This will also be required to form the outer wrapper of firebox plate, for a round top box.

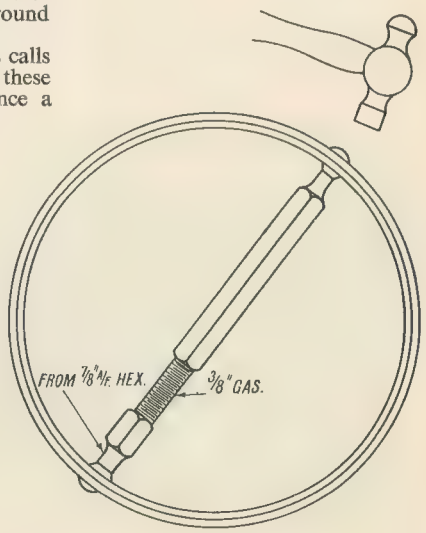
The actual flanging of plates calls for little comment except that these are bolted upon what was once a table of some machine tool about 3 cwt. in weight, and flanged with 5- or 7-lb. hammers to suit former. A throatplate is always the most difficult, owing to the double flange, one to shell and the other to wrapper. In this matter, the shell flange is formed first and a disc inserted a fit into flange, with a steel clamp ring of 1 in. by $\frac{1}{4}$ in. steel upon the outside. With this flange firmly located, it is an easy matter to form the wrapper flange. In the case of a throatplate which is only flanged for the lower side of shell, such as a traction engine boiler, the same system is adopted, but the plate is butted up only to the disc to preserve its form.

In the case of radii upon flanged plates, I have found one-and-a-half times plate thickness on inner side of plate, when flanged, to give good results. To flange a copper plate, perhaps 12 in. by 16 in. by $\frac{5}{16}$ in. thick will require three or four annealings. This I perform over a large tubular gas burner, and to a low red heat only. For the flanging of steel plates, this is done a little at a time, by bolting up on former and heating so much at a time with the acetylene torch. In the case of all plates, all drilling is performed after plates are prepared.

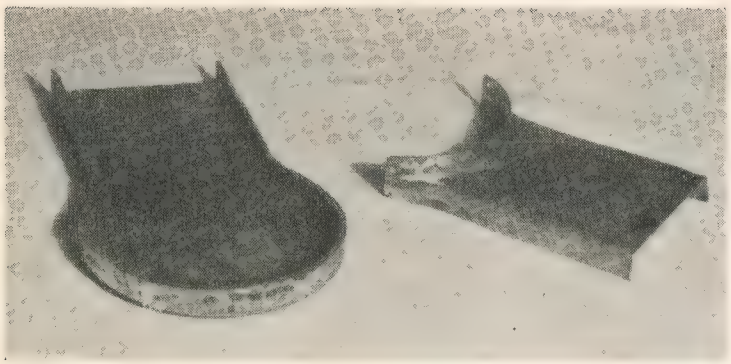
The actual act of riveting is a noisy operation. I am fortunate that I live in the country! The actual noise can be very much reduced if the rivet is well supported by a screw dolly, or rivet jammer, as shown. Another way to deaden any



Strength of boiler shell when drawn tube. Per linear inch of shell



Jamming a rivet



A properly flanged throat plate. Note feathers on backplate to meet foundation ring

noise is to have small sandbags which can be laid around the boiler while the work is in hand. A point to remember in all riveted work is that a countersink must be made upon the outside of the plate into which part of the head will form. A head formed upon a plain drilled hole is very weak and liable to fracture. The shank of rivet required to fill this countersink and form a good "snap" head is one-and-a-half times full rivet diameter. When snapping the rivet head, do not try to perform this operation upon say a $\frac{3}{8}$-in. rivet with a single blow; hold the snap at a slight angle, say 75 to 80 deg. and deal it several blows working it round the head to be snapped. After riveting, well close together the plates, one upon the other, always closing the weaker to the stronger. It will be seen that, to construct a boiler in this way, it is not possible to insert the firebox and tubes and then put in backplate, as is done with very small boilers of say 5-in. gauge engines. The firebox will be inserted and the tubes fitted from the smokebox plate. It will also be seen that rod stays will be required for a locomotive boiler; but as I prefer plate roof stays, I fit them to traction boilers where, as there is no central steam pipe, this can be done.

With regard to the actual silver-soldering of firebox and outer assembly, I have never found it needful to resort to brick and coke packing for this, preferring to use a large tip and do the whole boiler in the open. In any case, to enclose a boiler of 10 in. to 12 in. diameter by 4 ft. to 6 ft. long, would require something in the nature of a young brick-kiln. In the matter of the backhead just mentioned, a point to bear in mind in a very large type of boiler, having the top of firebox of a greater width than foundation ring opening will admit, is that it is better to fit firebox and attach the backhead with, say, $\frac{3}{8}$ in. by 26 turned screws. In actual practice, this job is done by what is known as "wedge riveting," but in work of the class under consideration this would not be of a practical nature. In two or three instances, I have used the system of turning round the backhead as introduced many years ago on the L.N.W.R. by F. W. Webb, which renders the riveting possible from the outside. An awkward foundation ring is needed, however, in this case.

Should there be any openings for man-holes or the like in the boiler whose diameter is more than eight times plate thickness, it should be borne in mind that a stiffening-ring should be riveted and silver-soldered to add strength. The ring should be of an equal thickness to the plate it is required to support. This will not apply to the opening for a locomotive dome, as here the bottom flange of dome itself will serve. In the matter of fireholes, I have found that the dishing of backplate and inner firebox door plate to dispense with the actual ring saves time and gas when silver-soldering the final assembly together. This could be carried a step farther to cover also the foundation ring joint; but I have never adopted this myself, as I prefer a foundation ring built up from bar copper or steel, as the case may be, and set slightly below the plates this being then filled up with the caulking medium.

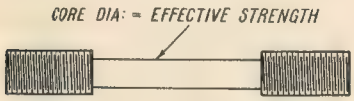
If we now assume the boiler to be ready for staying, those stays which should first be fitted are the side stays to locate the inner firebox. The total area to be stayed being known, it will be a simple matter to arrive at the number, diameter and pitch of stays required to support this with the required factor of safety. In a firebox, say, 8 in. wide, it is a simple matter to head these stays over. When this is done, a screw dolly can be fitted to support the stays while the outer ends are similarly dealt with. As an alternative, the stays may be nutted upon the side of the box next to the fire, but with bronze or gunmetal nuts, not brass ones. In all these stays, I have found that bronze is by far a more suitable material than copper as, when silver-soldering, the copper tends to soften and the stay can be stretched. However, a stay of $\frac{7}{16}$ in. or $\frac{1}{2}$ in. diameter has, even when annealed, still a very fair resistance to pressure; this point is, perhaps, not of such moment as in a small boiler. There is no reason why the stays should not be caulked with soft solder, except that if this is done the whole boiler may as well be soft-soldered.

With regard to soft-soldered boilers, I have found these troublesome due to leakage in use, and prefer to have no soft-solder whatsoever upon a boiler. From the point of strength, however, this is in the rivets whether soft or silver-soldered. One or two points in the matter of the plates may be noted here. On the back and throat-plate, and where any plate must blend with another, such as a throatplate running up between shell and wrapper, and a backplate running into a foundation ring, these plates should always be "feathered" down to a knife edge by the hammer. A sharp square edge or corner should never be used. Where an outer plate of firebox wrapper comes down to foundation ring level at front and back, the corners should be radiused as in a full-size boiler; a square corner could not be caulked. In a traction engine boiler fitted between the hornplates or firebox sides and the crown of outer wrapper, is fitted a strip of around $4\frac{3}{4}$ in. to 5 in. by $\frac{3}{16}$ in. section. This is known as a caulking strip. I have on several published drawings seen this shown as a tapered strip. This is not right, as a moment's thought would show. This strip, when riveted in, was caulked inside and out, any feathering being done on the actual wrapper crown.

From my own experience, I prefer to screwcut all stays in the lathe and chase a few thou. taper upon them rather than die them down; this takes longer, but ensures a better fitting stay. When the firebox is in place and the side and crown stays fitted, the fire tubes may

be fitted in place. A tap with an extension, to allow of fitting a handle and inserting through smokebox tubeplate, is made. Each hole may then be tapped say 26- or 32-t.p.i. The tubes should then be screwcut and chased taper upon one end and annealed each end. To insert the tubes and screw them in, I use a large old square file tapered from $\frac{5}{8}$ in. to 1 in. which will grip and drive from the bore of the tube, yet may be got out without trouble once the tube is home.

The tubes at smokebox end may now be expanded with a roller tube expander and taper drift which may quite easily be home made with



Locomotive-type side stays

Size of stay	Proportionate strength in steel
5 B.A.	38 pounds
5/32 x 40	45 ,,
2 B.A.	85 ,,
3/16 x 32	85 ,,
7/32 x 32	100 ,,
1 B.A.	100 ,,
1/4 x 32	150 ,,
5/16 x 26	250 ,,
3/8 x 26	400 ,,

For copper stays, assume 60 per cent. of above values

six silver-steel rollers in a small cage of such size that, when a tapered drift is inserted and turned, these will force the tube into close contact with tubeplate. After expanding the tube, ends may be lightly beaded over. At the firebox end the tubes may be lightly expanded only, as the threads will form a seal.

Copper tubes are subject to a fair amount of attrition from ashes, etc., and in a locomotive worked say upon a public miniature railway eight hours a day for six days a week from April to September, ease in replacement must not be lost sight of. The holes in the smokebox tubeplate should be smooth and round. I mount this plate upon a large faceplate and bore and ream each hole in the lathe to ensure this.

Foundation Rings

After the fitting of the tubes, the fitting of the foundation ring may be considered. In my first boilers, I used cast gunmetal rings which entailed a good deal of work in fitting. I now fabricate these in copper, or, for a steel boiler, in steel, from rectangular bar. Good fillets may be built up on the inside radii to blend with the outer radii of firebox plates. The ring itself should be set about $\frac{1}{16}$ in. below the plate edges, this may be filled over with silver-solder, or "Cuprotectic"; the edges of ring, both inside and out, may be chamfered off to give a lead in to this material. If at all possible, rivets should be fitted radially through the radii of both back and throat plates.

This I think covers the main points of construction. It must be noted, however, that boilers of this type, and notably if made of copper, are very expensive to construct. A Belpaire locomotive type boiler of 10 in. diameter with 2 ft. 6 in. shell and firebox 14 in. long in $\frac{1}{4}$ in. and $\frac{5}{16}$-in. copper plate at today's prices cost £60 all in, but exclusive of labour. Made in steel there would be a very great saving in cost of material, but labour would be much greater in view of the heavier work involved. For instance, to flange a plate of equal thickness takes more than twice as long in steel than copper; and steel is more liable to start hair cracks during this operation, and thus form a waster. A heavy tool investment will be required, in addition. I am fortunate in that my workshop is equipped for all classes of medium-heavy machining, and for all classes of welding of any section; also both acetylene and coal gas cutting up to 12 in. in thickness. However, in this case, the workshop has other uses, and the construction of small boilers and engines forms only a small part.

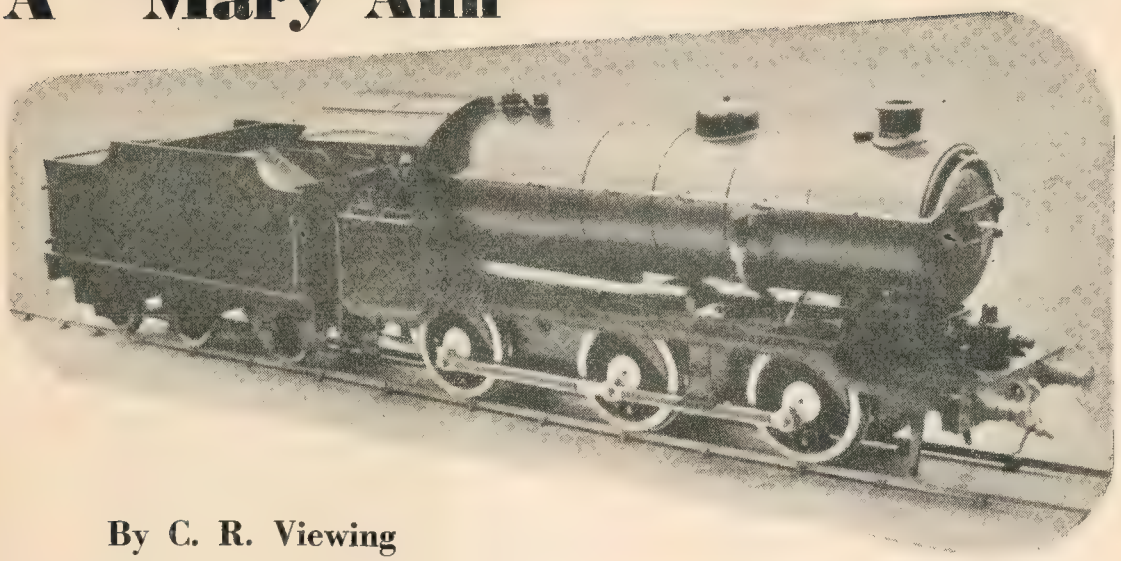
The foregoing remarks are not made with the intention of trying to deter the would-be builder, but to point out what must be taken into consideration should too ambitious a programme be envisaged. Judging from the number of chassis which never receive boilers, it seems that most people find the boiler the hardest part of the job.

Before concluding may I pass on a few tips at random upon boiler work in general which I have culled over the years from full-size practice, but not seen mentioned before. In the case of builders of marine, Cornish or Galloway type boilers, may I draw attention to the fact that a flue subject to external pressure and unsupported by stiffening rings, and having a length greater than its diameter, must be of a plate thickness of one-and-a-half times shell plate thickness if designed in accordance with the opening remarks of these notes. This does not apply to a vertical boiler, where the firebox is a section of a truncated cone. If greater than its diameter in length, then stiffener rings must be fitted, and in any case will be needed on any flue placed at one-and-a-half times diameter centres.

When rolling a shell plate or wrapper plate from sheet, take care that the grain of the sheet is placed circumferentially in the rolling and not lengthwise. Where a plate or rod section is bronze-welded and a caulking alloy such as Cuprotectic or Sillbralloy is the final joint, use a flux where the caulking medium will come into contact with the brazed joint, or pinholes are likely. Where firetubes are fitted into a locomotive-type boiler they should not lie parallel to the centre-line of shell, but rise slightly to the smokebox tubeplate, say $\frac{1}{8}$ in. in one foot, to allow for expansion. Where it is possible, the plate or box girder type of firebox roof stay is far better than rod stays; for instance, if we have a firebox crown say 5 in. by 10 in. in area, at 100 lb. per sq. in., we have a loading of 5,000 lb. upon the box; therefore, two roof stays of $\frac{1}{2}$ in. plate extending the full length and having a total section of $1\frac{1}{4}$ sq. in each, will offer a resistance to collapse, with a tensile strength in copper of 25,000 lb., of roughly 65,000, a very ample margin of safety, and far more stable than rod stays. In steel boilers, a margin must be allowed for the action of rusting; and in a locomotive boiler, if it should be of more than one sheet in telescopic rings, set it so that no small deposit of water will remain in the bottom of the shell and cause grooving. This and plate wastage both on the water and fire sides of firebox are the main causes of failure in the steel locomotive-type, and in some cases difficult to detect. The drilling of a hole as is sometimes done will not always give a true result; and in testing steel boilers myself, I have always preferred the hammer or pick-hammer test.

Finally, never raise steam in any boiler too quickly just to see that "she will raise steam in three minutes," or something of the sort !

A "Mary Ann"



By C. R. Viewing

THIS model was commenced during 1945, and has survived three house moves with all the attendant workshop "rebuilds."

Most of the work was carried out on an "Atlas" 3-in. lathe.

The construction followed the usual lines, except that the job of finding material, towards the end of the war, was, as we all know, a task suited to a Sherlock Holmes! The material purchased was mostly rough stock, together with parts scrounged from the scrap box. Of course, the cylinder casting and wheel castings were amongst the former, and I had to machine 18 tender wheel castings to get 6 good ones! The suppliers made no bones about it and sent more castings as they were demanded.

The boiler is lagged with asbestos and covered with thin sheet brass. As the contour of the firebox was not quite regular, because of the lagging varying in thickness, the spectacle plate or cab front was first cut out in card, fitted in place, and irregularities filled in with "cold solder," the resulting template gave a fairly good contour to the finished front.

The tender is flush-riveted and soft-soldered; it is fitted with the usual hand-pump, and the tank filler lid is made to swivel to one side.

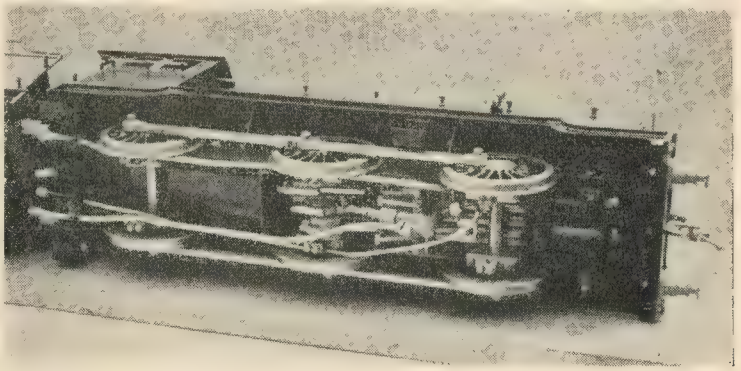
The valve-gear is, of course, Joy's, and I had trouble in making the die-blocks in their original form. After trying rollers, and being politely choked off for using them by our old friend "L.B.S.C.," I set up a length of silver-steel by soldering it to a brass back-plate and machined it to the correct radius in a manner similar to that used for the curved guides. The result was a set of nice, long die-blocks with plenty of bearing surface.

The engine is finished off in the usual manner with half-round wire beading, the painting being the "*bête noire*" (!) of the whole job. She steams well, although I have not been able to test her on a track, such an amenity being practically non-existent in my district; but, I know that the gauge is correct, as I have checked the width of the grooves cut into the bench top by the spinning wheels!

["L.B.S.C." described the construction of this 2½-in. gauge 0-6-0 L.N.E.R. Class "J39" locomotive in THE MODEL ENGINEER during 1934, in the following issues, dated: January 4th, 11th, 18th and 25th; February 1st, 8th, 15th and 22nd; March 1st, 8th, 15th and 22nd; April 5th, 12th, 19th and 26th; May 3rd, 10th, 17th and 31st; and June 28th.

Mr. Viewing's example was entered at the recent "M.E." Exhibition, where it succeeded in winning a well-deserved V.H.C. Diploma.

Castings and drawings are available from our advertisers:—Dick Simmonds, and Kennion Bros.—Ed. "M.E."]



The neat "works" of Mr. Viewing's "Mary Ann"

Must they be scrapped?

UNLESS A HOME CAN BE FOUND FOR THESE TWO HISTORICAL ENGINES, THEY ARE DOOMED TO DESTRUCTION

THE letter reproduced here was sent to us by the S.E. Gas Board, and speaks for itself. These old engines are both double acting beam engines, compound expansion, jet condensing. "Alpha" has two vertical cylinders with their centres on the long centre-line of the engine. "Beta" has two vertical cylinders with H.P. cylinder inside L.P. cylinder, thus, its L.P. piston is annular in form. "Alpha" has a separate D-slide valve to each cylinder, whilst "Beta" has one D-slide valve common to both cylinders. Further details of "Alpha" are given below, together with photograph. Details and photographs of "Beta" appear on the opposite page.

"ALPHA"

Indicated Horse Power ...	30
Steam Pressure at Stop Valve	40 P.S.I.G.
Governed to	32 R.P.M.
Diameter of Flywheel ...	14 ft.
Estimated weight of Flywheel	3 tons 7 cwt.
Overall length of Beam ...	11 ft. 2 in.
Estimated weight of Beam ...	1 ton
Estimated weight of Complete Engine	10 to 12 tons
Throw of Crank	1 ft. 6 in.
Stroke of H.P. Piston ...	2 ft. 1 in.
Stroke of L.P. Piston ...	3 ft.
Diameter of H.P. Piston ...	12⅝ in.
Diameter of L.P. Piston ...	20⅛ in.
Diameter of H.P. Piston-Rod	1¾ in.
Diameter of L.P. Piston-Rod	2⅛ in.
Effective Area of H.P. Piston	125.2 sq. in. up stroke
Effective Area of H.P. Piston	122.8 sq. in. down stroke
Effective Area of L.P. Piston	318.1 sq. in. up stroke
Effective Area of L.P. Piston	314.6 sq. in. down stroke

SOUTH EASTERN GAS BOARD

709, OLD KENT ROAD
LONDON
S.E.15

Telephone: NEW Cross 3065
Telegrams: Squalene, Peck, London

Your Ref.
Our Ref. ENG/ME/SCH/SL.

22nd July, 1954.

The Editor,
The Model Engineer,
19, Noel Street,
LONDON, W.1.

Dear Sir,

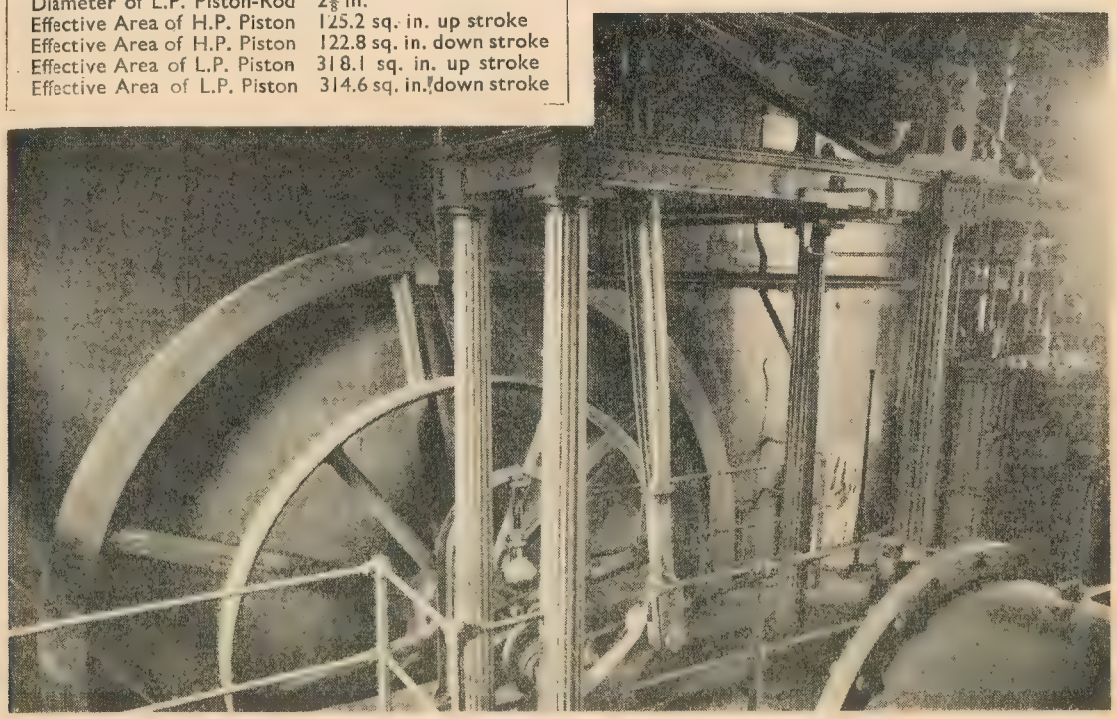
There are installed at the Old Kent Road Works of the Board two beam engines dating from 1864 and 1866 respectively, which have become redundant as the result of the closing down of the gasmaking plant. The site on which the engines are standing must be cleared within the next three or four months, and before consigning the machines to the scrap heap, the question has been asked whether any organisation would be interested in acquiring them for preservation.

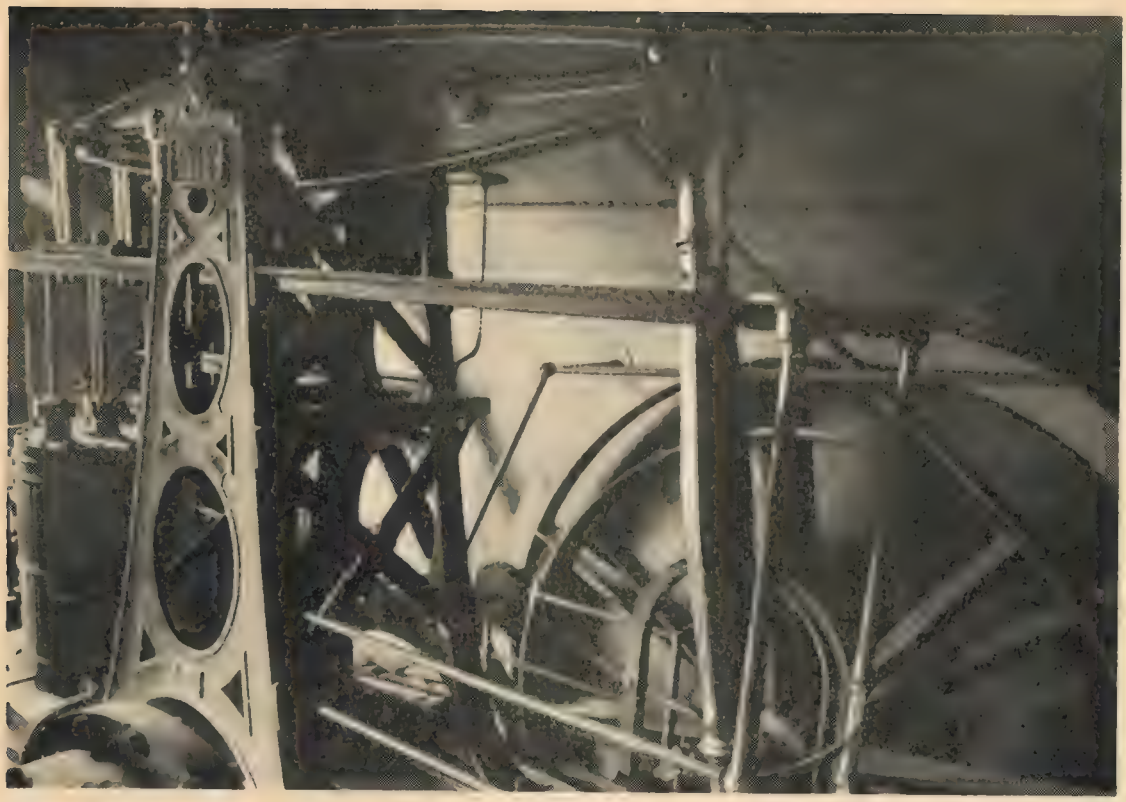
Although some ninety years old, the engines are in first class running condition, and have been under steam within the last three months, producing a 26" vacuum in the condensers. Until 1914, they were the main source of power for gas pumping through the gasmaking plant of the works, when the enlargement of the Works and the installation of more powerful machinery relegated them to standby duties, which they have performed ever since.

Having some knowledge of the wide field of circulation of the "Model Engineer", I felt that perhaps you may be able to assist me in establishing contact with someone who would be interested in preserving these machines, and I have pleasure in enclosing herewith leading particulars and photographs. Perhaps you would be good enough to advise me as to the best course to pursue, bearing in mind that the time available in which to conclude the transaction is extremely short.

Yours faithfully,

ENC. MECHANICAL ENGINEER.





"BETA"

Indicated Horse Power ...	30
Steam Pressure at Stop Valve	40 P.S.I.G.
Governed to	32 R.P.M.
Diameter of Flywheel .	12 ft.
Estimated weight of Flywheel	2 tons 11 cwt.
Overall length of Beam ...	11 ft.
Estimated weight of Beam ..	1 ton 2 cwt.
Estimated weight of Complete Engine	10 to 12 tons
Throw of Crank	1 ft. 6 in.
Stroke of each Piston ..	3 ft.
Diameter of H.P. Piston .	10⅝ in.
Diameter of L.P. Piston ...	2 ft. 1 in. x 1 ft. 1½ in.
Diameter of H.P. Piston-Rod	1¾ in.
Diameter of each of 2 L.P. Piston Rods	1⅝ in.
Effective Pressure Area of H.P. Piston	88.7 sq. in. up stroke
Effective Pressure Area of H.P. Piston	86.3 sq. in. down stroke
Effective Pressure Area of L.P. Piston . .	355.5 sq. in. up stroke
Effective Pressure Area of L.P. Piston	351.4 sq. in. down stroke
Height of highest point from floor level	11 ft. 6 in.
Depth of Flywheel Pit below floor	6 ft.
Approx. Floor Space for Complete Engine	19 ft. x 9 ft.

SMALL GENERATING PLANT PROBLEMS

By J. W. Cooper

I WAS recently called upon to assist with a small generating plant that did everything except perform as such. As this problem may have been met by some readers, I think the following remarks may be helpful.

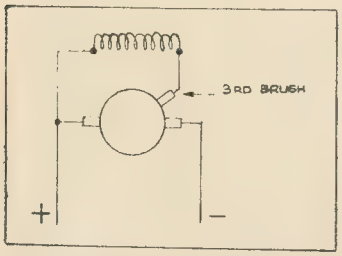


Fig. 1. The third brush connection

Regarding this plant, and upon further investigation of the trouble, it was learned that the generator being used was an ordinary car dynamo, and it was being used without a battery of any kind. Now, a car generator is a special machine designed to operate under a more or less special set of conditions: the generator is a shunt-wound machine, but it does not, in operation, work as a true shunt-wound dynamo. The normal shunt generator will provide a more or less steady voltage with a varying load at a constant speed; should the speed of the prime mover vary, the voltage will vary, rising as the speed increases, and falling as the speed falls. To cater for speed and load variations, it is usual to incorporate in the shunt circuit of the dynamo, a resistance so that the current flowing in this circuit may be varied to suit ruling conditions; this regulator is operated by hand, and the voltage may be raised or lowered as required.

In a way, the car generator is a more or less automatic machine so far as regulation is concerned. As most people will be familiar with the set-up of a car installation, it will be obvious that the engine speed is rarely to remain constant for any great length of time, and, therefore, so far as the generator is concerned, any form of hand regulation would, of course, be out of the question. This more or less automatic regulation of the car generator is obtained by making use of field distortion and armature re-action; this enables the armature active coils to come into different positions in the field system, which would be equivalent to moving the third brush, forward or backward from its main brush to suit load conditions. The effect is to reduce the voltage as the speed rises, and raise it as the speed falls. It will be seen that if we arrange for a third brush to be placed on the commutator in a suitable position, it can be set so that the field coil supply will come under the influence of this shifting field, and the adjustment will be automatic so far as the current value is concerned.

It must be stressed, that where this

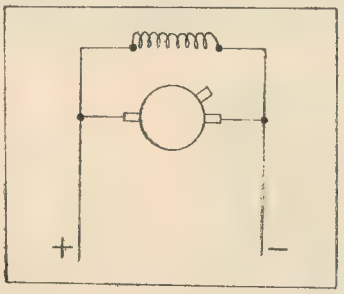


Fig. 2. Re-connected for shunt generator

type of dynamo is used, it must be coupled to a battery of the same voltage as the generator; this battery acts as a stabiliser, and holds the voltage at a steady value, regardless of what is taking place in the generator itself. For a lighting plant, this battery need not be a large one, it would be usual practice to make the generator do the bulk of the work in supplying the load. In most commercial sets of this nature, the battery is a small one, only sufficient for engine starting, and to supply a very small lighting load on its own. These sets are chiefly automatic; as soon as a certain load is exceeded, the engine is started and the load then carried by the generator. The battery is arranged so that it is re-charged during the time the engine would run; bearing in mind that the current demand upon this battery would be very small; the re-charging under these conditions is not a problem.

It is possible in most cases to re-connect a third brush generator so that it can be used as a true shunt-wound machine: all that is necessary is to remove the third brush lead and attach it to its nearest brush of the same polarity. If this lead cannot be determined from outside observation, the front end-shield of the generator should be carefully removed, and then the leads will be easily seen. It will be found that one brush will have a field lead attached to it; the other field lead will be connected to the third brush, and the remaining brush will have no lead at all, As now connected, the machine will not be self-regulating, and it will be necessary to provide an external regulator in the form of a variable resistance; this resistance being connected in the shunt field coil circuit.

Where a shunt regulator is used, it must be capable of carrying the full load current of the field coils, with a minimum rise in temperature. No particulars of field currents would be available with any generator in the wound state, unless it is marked on the name-plate, which is rarely done with any type of machine. To determine the field current for the purpose of designing the shunt regulator, the generator should be run up to full speed or until it shows full volts; an amp. meter should be fitted in the field lead and the current read off. Now, from a suitable wire table, the resistance can be worked out, and a

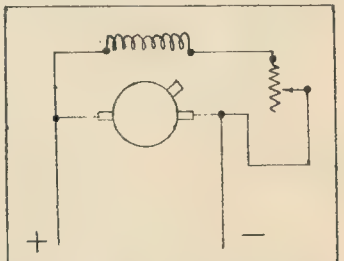


Fig. 3. Position of shunt regulator

size of wire chosen to suit the ruling conditions. With this class of generator, the field current could be between 2-4 amps. A resistance wire known as "Eureka" is very suitable for this type of resistance.

The diagrams will show the connections of this type of dynamo.

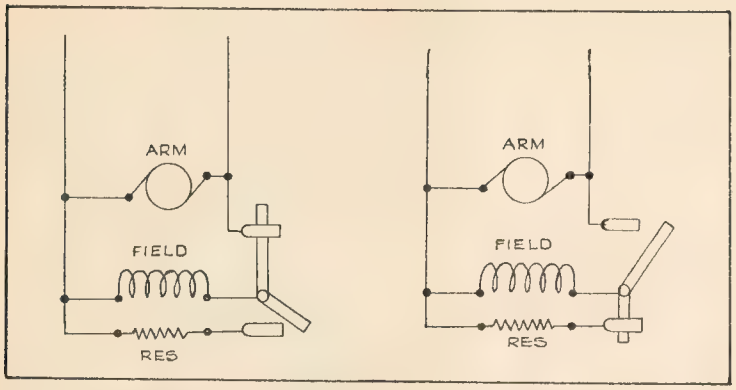


Fig. 4. Discharge switch, working position

Fig. 4A. Discharge switch, off position

Fig. 1 shows the connection as a third brush generator, and Fig. 2 shows the third brush lead removed and connected to its main brush. Fig. 3 shows the position in which the shunt regulator would be connected. Where a shunt regulator is used, it must be stressed that this regulator must *not* have an Off position; if this is not observed, serious damage may be done to the insulation of the field coils, Any circuit that is highly inductive—and a field coil is so—must never have its supply suddenly disconnected; the reason for this is, should the supply be suddenly cut off, the collapse of the magnetism will set up an inductive current in the coil, and the voltage can reach a very high value, in some cases several thousands of volts; hence the reason for keeping this circuit closed all the time. There are instances in which it is necessary to disconnect the field coil from its source of supply, as in a separately excited dynamo for example; in a case of this nature, a special switch is used, known as a field discharge switch. The connections of such a switch is shown in Fig. 4 and 4A. It will be noticed that a resistance is connected in such a manner that when the switch blade is brought into the down position, this resistance is connected to the field coil in parallel before the generator circuit is broken. This resistance is known as a discharge resistance, and is there to provide a path of discharge for the inductive voltage that exists at the moment of interrupting the circuit. Suitable lamps in series may be used in place of the resistance if necessary. All types of inductive apparatus of this nature must be fitted with this protection; it should be stated that the resistance requires to be wound non-inductively.

When dealing with generators generally, and where the direction of rotation is not known, in the case of small machines, they should be run up as motors; using them as generators, they require to be driven in the same direction as they ran as a motor. If the driving member cannot be reversed, the field connections should be changed over to put matters right. Sometimes it is found that no matter what is done, the generator fails to excite; this is probably due to the fact that it has been standing idle for a prolonged period. In a case like this, it is only necessary to excite the field coils from a battery of some kind. What has happened is that over a period of idleness, the residual magnetism has been lost, and there are no lines of force left in the iron to enable any current to be generated; the restoration of this magnetism is all that is necessary to enable the generator to "build up." Fig. 5 shows a simple and typical generator switchboard.

I have noticed in a number of instances that there seems to be different ideas as to cable and wire sizes for a particular application. The current-carrying capacity of copper wires is based upon the fact, that one square inch of copper is considered as being the area as suitable to carry a current of 1,000 amps. Now, current ratings may vary quite a lot for different applications, and in practice they do. The usual two factors are volt drop in a given length, and the final temperature rise that can be safely allowed. In the ordinary wiring of electrical installations, it is usual to work at 1,000 amps, this value being safe for all cases. This would not apply, however, in every case; there could be cases where it would be correct to work at values much higher than 1,000 amps. One simple example of this would be the cables supplying the rotor current of an a.c. motor, the cables of which would not be in circuit after the motor was up to speed; this application would refer to a machine that had brush shorting gear. In a case like this, it would be possible to work at a value of up to 3,000 amps per sq. in. Other applications where the value of 1,000 amps would not be used would be in the operating of "short-rated" apparatus, that is, anything that would only be in circuit for a short length of time. Another example is in crane and traction

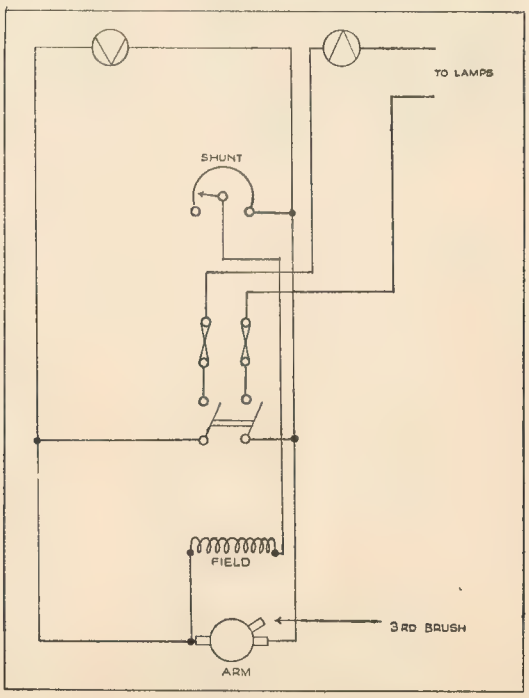


Fig. 5. Simple switch-board for generator

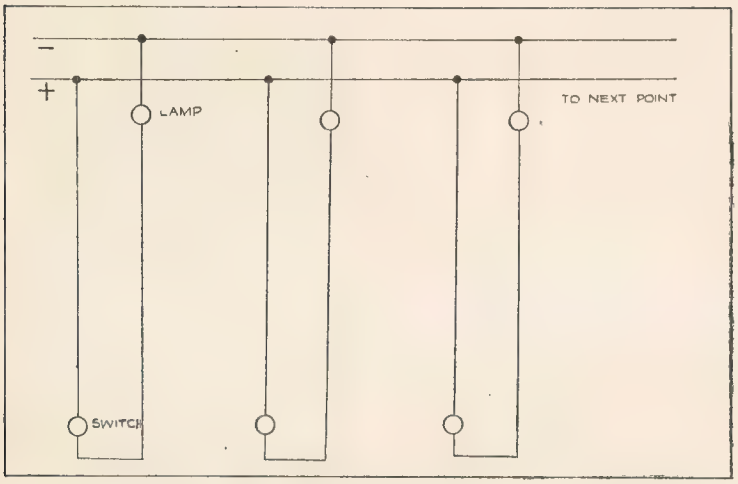


Fig. 6. Tree method of wiring

motors; which usually have a rating as short as ½ to 1 hour; here current values may be as high as 3,000-4,000 amps. In some cases, and with special insulations, the final temperature is the melting point of the copper wire itself; this would be an example of an exceptionally high value being used. The limiting factor in most cases like this is the elimination of heat to a large extent, which is usually done in practice by air-cooling, and in some cases by the use of oil.

Where low-voltage installations are contemplated, it is stressed that strict attention should be given to the wiring and style of wiring used. Cables supplying lighting points should not be less than 3/20 or a single 14-gauge wire. Also the runs should be as short as possible. For an installation of this nature, it would be preferable to use the old "tree" system of wiring; with this system, the looping-in method is dispensed with the respective runs being jointed and soldered along the runs. Fig. 6 shows this method of wiring. Fig. 7 shows the looping-in method; here it will be noticed that a length of wire carries along to the next position, and the distance might be over long, but with the tree method, this length is dispensed with, and its resistance value also. The ideal method is shown in Fig. 8; here a central position is chosen, and the idea is to arrange the runs to be as near as possible the same length. It will be found in practice that this method works very well, and very little volt drop will be noticed as the load is increased all round.

A question arises from time to time relating to the fusing of copper wires. From the fuse tables, the fusing current values of different

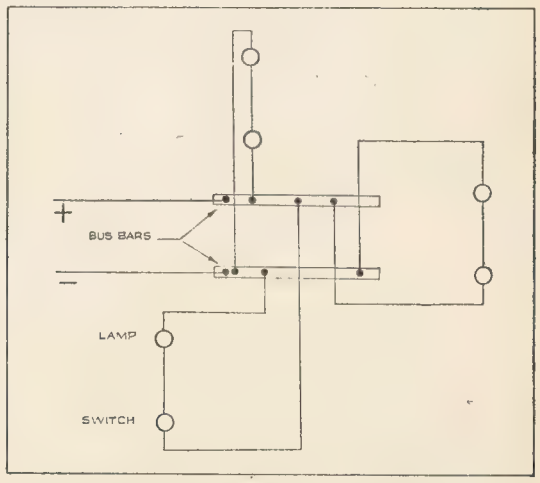
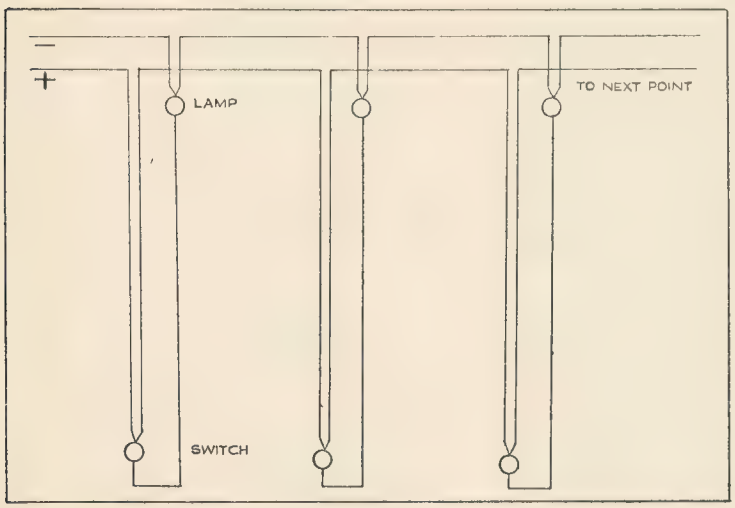


Fig. 8. Centralised method of wiring

Below: Fig. 7. Loop method of wiring



wires are given, and these values mean exactly what they say. If a table shows that a certain wire size fuses at, say, 5 amps, it should be obvious that this size wire would be unsuitable in a circuit expected to carry 5 amps of current and a wire fusing at a higher value would naturally be chosen. The fusing current in any installation is determined by several factors, and is affected by different load demands, allowable temperature rises, etc. As an example of load demand, a simple a.c. squirrel-cage motor may be quoted; in the case in point the motor is to be switched direct on to the supply, without any control gear at all. Although the normal running current of the motor

(*Continued on page* 318)

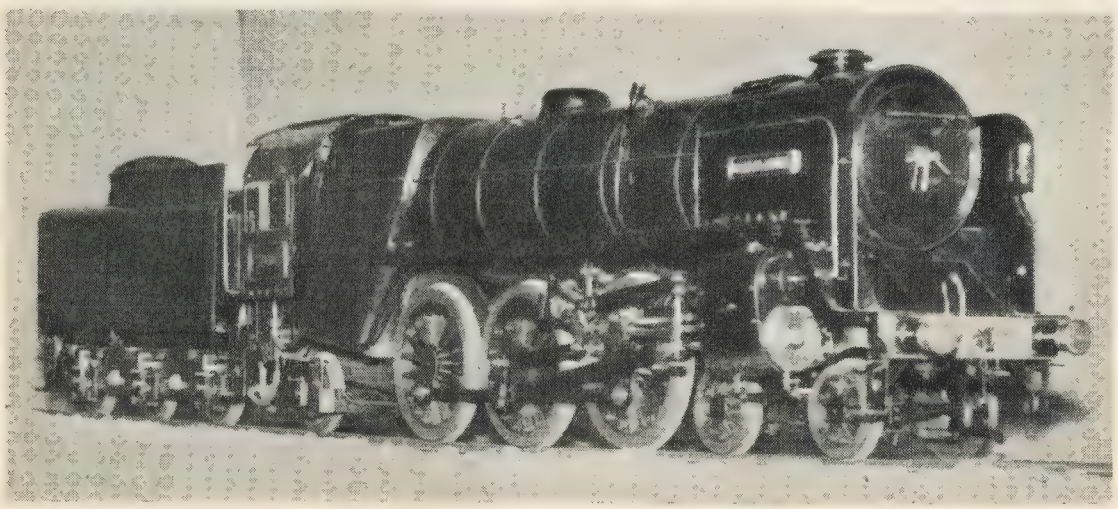
L.B.S.C.'s Lobby Chat

• WHY NOT WATER-TROUGHS ?

AT the time of writing, correspondence is still rolling in concerning various points of locomotive design and operation, and their relation to long-distance nonstop running ; and as at the moment, the weather outside is what the kiddies call " worse 'n awful "—too bad to do any kind of running at all, nonstop or otherwise—let's gather around the old cheerful lobby stove, pass the tea-bottle, and do some more investigating. One reader suggests that the problem of water supply on a long nonstop run, could be overcome by the provision of water-troughs, as in full-size practice, saying that his club (I haven't his letter by me at the moment, but I believe it is the Hayes and Harlington) put down a temporary trough, and found that it was quite possible to fill a small locomotive tender at quite a moderate speed.

Well, there's nothing new under the sun. Old readers may recollect that soon after I started to write these notes, a photograph appeared in them, showing an experimental length of water-trough which I put down on my old straight 65-footer at Norbury. The caption was " Coming events cast their shadows before." As most folk know, if anybody starts in to assert that something connected with little locomotives is impossible, especially when the asserter hasn't done any locomotive-building himself, it gets your humble servant's back up, in a manner of speaking, and I usually set to work and do it. Now, a certain party who put lots of engines on paper, but nary a one on the track, once " proved " by figures, that a speed of something like 18 m.p.h. would be needed to scoop water out of a trough into a 2½-in. gauge locomotive tender. I knew that *that* was wrong because when I put some water in the domestic wash-basin, and flicked a little firing-shovel over the surface, like the action of a tender water-scoop, it picked up the water and shot it over the edge of the basin on to the scullery floor ; and I didn't have to move the shovel at 18 m.p.h. or indeed anything like it, either !

Anyway, the result set me thinking, and on the following Monday, after delivering my copy at the old offices in Farringdon Street, I wended my way to John Smith's metal warehouse in Clerkenwell, and got something which was just the " cat's whiskers " for an experiment, viz, a long length of thin channel-brass. It was 1 in. wide and ½ in. deep. At that time, I only had the 2½-in. gauge road, the rails being bull-head section " sherardised " steel, supposed to be rustless, but they eventually rusted away, as did the spring chairs. In passing, I might mention here, that when they became unfit for further use, I relaid the line as a multiple-gauge road, three of the rails being composed of a very hard extruded copper-base alloy which looked like brass, and the other an aluminium alloy. The latter proved very much inferior to the former, eventually sagging in places between the sleepers, soon showed signs of wear on the heads, and despite frequent cleaning, the running surface was always black and greasy. I don't know if the modern aluminium-alloy rails have been improved—maybe they have ; but my experience of this kind of rail, set me clean against it, and I should never use it on a line of my own. The rails on my



Mr. R. A. Negrete's " Britannia," built in Argentina

present line are made from the same kind of extruded metal mentioned above ; some of them did duty on the original straight road which I first installed when coming to my present address in 1930, and the rest were purchased from the makers, a Birmingham metal-merchants' firm who supply a great variety of drawn and extruded sections, when the continuous line was built in 1936. They have withstood hard usage, and are better now, than when first laid, as the tops are flat enough to afford full-width contact to the treads of the locomotive wheels ; only damp weather, or oil dropped on the heads, will cause slipping—provided that the driver knows his job !

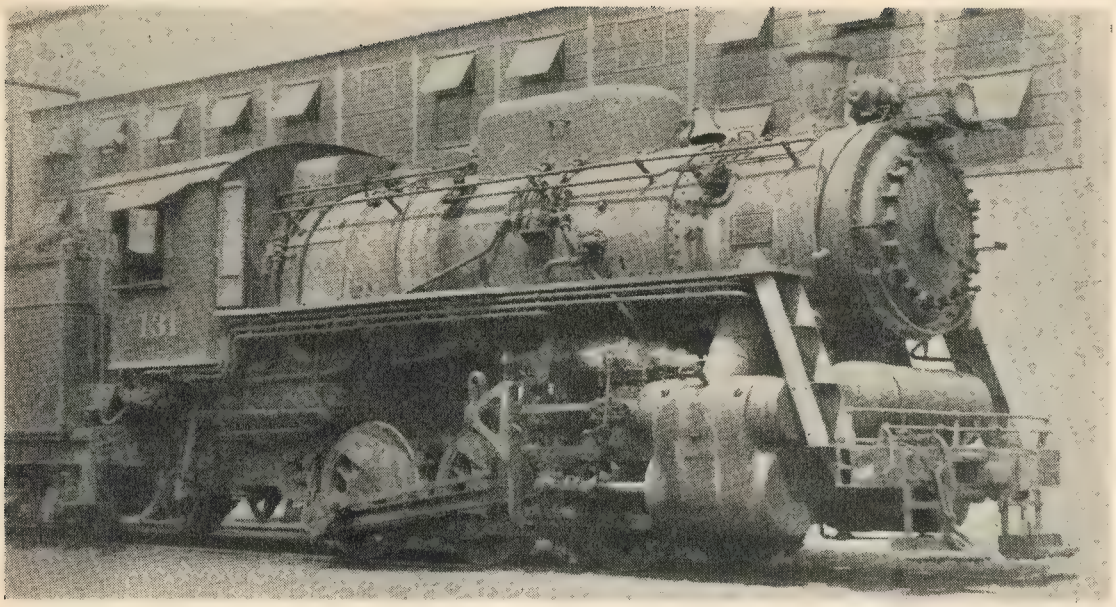
The length of channel-brass was duly laid between the 2½-in. gauge rails, and I rigged up a rough test " tender," which was a tin tank on four wheels, and fitted it with a ragtime water scoop. To lower it into the trough, and lift it out again, I fixed a trip lever at the side, the trips being just ordinary nails knocked into the longitudinals at the correct distance from the ends of the trough. Naturally, there were a few spots of adjustment called for ! The trough was filled from the garden watering-can ; and at first, the water overflowed at one end while the other end was left high and dry, the line not being as level as I imagined it to be—you can't fool Nature ! That was soon put O.K. and then the scoop needed setting to rise and fall by the right amount. However, to cut a long story short, after much splashing (of which two interested spectators, the dog and cat, got a share), I found that it was possible to lift water from the trough to the tank, at old *Ayesha's* running speed. After all these years, the lads who have been experimenting with water pick-up, have obtained the same results.

Maybe followers of these notes will wonder why I haven't installed the track-troughs on my present line. The answer to that is simply that owing to the four rails, I can't put the trough in the middle ; if the line was laid for one gauge only, the troughs would have been installed long since. It would have been quite easy to fit a float-controlled valve, as in full size, to keep them replenished from the water-tank ; and the tenders would have had an automatic scoop, similar to that on the locomotives in my " tales of the future." But they wouldn't have had much personal use, for I can run a long way on one tenderful, on most of the engines ; for example, *Annabel,* the 2-6-6-4 Mallet, ran on a recent evening, for well over an hour, nonstop, when I was trying a sample of Wakefield's SHS cylinder oil, sent to me by the firm. It isn't the same as the grade used at the Beech Hurst " do " ; that was Cresta TE, but the firm said that it wasn't exactly suitable for cylinders made from non-ferrous metal, as there was an animal-fat content in it which, though extremely beneficial for cast-iron cylinders, might cause corrosion in bronze cylinders and valves. They sent me some to try, as well as the grade mentioned ; the SHS is a pure mineral oil, non-corrosive. Anyway, *Annabel* ran very sweetly indeed on the SHS, and it worked fine in the tiny mechanical lubricator. At time of writing, I haven't tested the TE grade, but hope to, within the next few days.

Working Life of Piston-valves

Apparently there are still a lot of good folk who are under the mistaken impression that piston-valves are inferior to slide-valves for little locomotives ; and their principal argument is that, apart from the business of getting the exact fit, piston-valves will blow in a short time, due to wear, whilst a flat slide-

A really *Big Sister being erected at the Vulcan Foundry*



A typical American industrial switcher—suitable for a 3½ in. or 5 in. gauge job
How about this for power on sharp curves ?

valve remains tight even when badly worn, steam pressure keeping it in contact with the portface. Now to put it plain and blunt, as my old granny would have said, a lot of tommyrot has been both said and written about piston-valves. The most ridiculous assertion that I ever heard, was the claim that somebody or other had turned valves to such a close fit in the liners, that the heat of his hand prevented them from entering. What on earth would have happened to them when steam got at them inside the liners, was a subject that was *not* explained ! Now listen : any reader of these notes who can turn and fit the piston to the cylinder bore, with the average degree of accuracy, can turn and fit piston-valves to the liners ; nothing more is needed. You can take that as pure gospel according to Curly. Proof ? Only too glad to produce it, and at the same time give a practical illustration of the life of a little piston-valve.

Just recently, the chairman and secretary of the Buenos Aires "Curly Locomotive Circle" were over here on a business trip, and they naturally came to see how your humble servant was getting on, having a standing invitation. Bro. Negrete, who speaks English better than some natives, acted as interpreter for Bro. Todaro, who doesn't, so we got on fine. In course of conversation, the subject of blowing piston-valves arose, and as there is nothing like a practical demonstration—"seeing is believing"—I steamed up the 2½-in. gauge 4-6-2 mentioned in a recent lobby chat, viz. *Fernanda*, and let Bro. Negrete drive her. When starting off in full gear, each beat was just like the sound made by pulling a cork out of a bottle ; not a ghost of a wheeze between the "whops." When running fast, notched up nearly to middle, the exhaust was an exceedingly rapid purr, but the beats were still clearly distinguishable. Both visitors were firmly convinced that there was nothing wrong with either the piston-valves, or the valve-gear, and were astonished at the length of time the engine ran on one firing. As comparisons are said to be odious, I won't record their impressions of certain other small locomotives that they had seen.

This is the rub ; those piston-valves haven't been out of the liners for *eighteen years*. One is bronze, and the other rustless steal ; they were made a sliding fit, just like a piston in a cylinder bore ; they are plain bobbins, with neither rings nor grooves. The "secret" is simply *proper lubrication* ; the mechanical lubricator has always maintained a "microscopic" oil film between the bobbin and the liner, so that the actual metals have never come in contact, consequently there has been no appreciable wear. The oil also makes a perfect seal, consequently there is no blow. Simple when you know all about it, isn't it ? And the great thing is, that any reader with the average amount of gumption can go and do likewise, and get the same result. Nuff sed !

Records Coming Up

In a previous Lobby Chat, I mentioned that some of the lads of the villages were going to see how long their engines would run non-stop. Well, they are at it ; several reports have already come in, and the Beech Hurst record has been well and truly broken. Mr. A. Senchell, the secretary of the Chingford club, telephoned me at midday on Sunday August 22nd, with the information that on the previous day, Saturday, August 21st a *Hielan' Lassie* built by a club member, had run a distance of 70 miles non-stop, in 10 hours and 10 minutes, during which time the boiler had been fed with an injector made to my instructions, as the engine has no pump. The 3½ in. gauge job thus beats the 5 in. by ten miles; hearty congratulations to all concerned.

Two or three readers join issue with my remark that a single passenger is a featherweight load for a 5 in. gauge engine, asserting that it is quite sufficient to cause a heavy blast on the grades of the Beech Hurst line. I don't agree ; neither will the

majority of the followers of these notes, especially those who own locomotives that are really efficient, and do the job with a minimum of effort. The Bursledon line that was owned by the late Bro. Wholesale of blessed memory, had a long grade on it, far more severe than anything on the Beech Hurst road, as it was 1 in 75, with two reverse curves in it, leading up to the fly-over bridge. The 2½-in. gauge L.N.E.R. 4-6-2 *Tishy* which I rebuilt for our departed friend, and which I have here now, would take that grade on the run with *three adults on three cars*, without any signs of blowing the chimney off the smokebox. It was simply a question of " dropping the lever a bit," as full-size drivers say, until she settled down to the steady pull required to " lift " her load. The only time she really did " talk to the sky " was when Bro. Wholesale stopped on the grade, and tried to start again. She wouldn't have it with three up, but she managed it with two. *Annabel* the Mallet started without difficulty on the same grade, with six adults on four cars ; and the blast was little more than normal, after the first few cracks.

On the Up Grade

Casting memory back to the time when I was living at Greenwich, Conn., U.S.A. (24 years ago now—doesn't the time fly !) Calvert Holt and myself had running powers over a mile-long line at Rhinebeck. On this, there was a long grade of 1 in 70. Time and again, a 3½-in. gauge engine would take us both up that, on the run, by just lengthening the cut-off a little, and no roar from the chimney, or rather smokestack, as our cousins call it. The beats were just a little louder, and there was normally no fire-lifting nor spark-throwing ; though occasionally Holt who was a " mad " driver (engineer, in U.S.A. and Canada) would pull the throttle wide open, and drop the Johnson bar (reverse lever to you) right down in the corner, with the result that the locomotive would roar up the grade with the stack emulating Mount Vesuvius in eruption. On one occasion he set my overall coat alight, and it was only by very quick action, that I escaped severe burning. During one of my visits to the Bursledon line, when Bro. Wholesale was alive and well, he wanted to see how fast old *Ayesha* would take him up the 1 in 75 bank, so I said O.K. and told him to make up the fire just before he hit the bank. He did, and as he approached it, he gave her the lot, with between 85 and 90 lb. on the " clock." I've never seen anything like the way she went up, either before or since ; there was no appreciable diminution of speed, but the exhaust steam, plus red hot cinders, shot straight out of the chimney for fully three feet in the air, like a squib going off, before it started to spread out. There wasn't much left in the firebox by the time she crossed the bridge, but what remained was absolutely white-hot, so he told me when he finished the run. The old girl just took it as a matter of routine, and when I took over for a few trips around the line, she behaved just normally and gave no sign of her mad fling ; but it is said that a steam locomotive has life, and I believe she has, because sometimes, when she is running with one of my few personal friends, she will make a sudden bold dash and try to run away with him, as though remembering her exploit at Bursledon. She actually *has* run away with two or three full-size drivers who underestimated her power ; *Tishy* has done the same. No wonder all engines are " shes " !

Talking about underestimating the hauling power of a 2½-in. gauge locomotive, recalls to mind that when Keith Wilson announced to the members of the Harlington club that he would haul passengers at a fete with his 2½-in. gauge *Mary Ann*, a " J39 " 0-6-0 built to my instructions, he was greeted with " Nuts ! You'll never shift a single passenger " and the Watford club members were equally " sarky." Well, *Mary Ann* went to the fete, and not only hauled a single passenger, but got away quite well with *two adults and three children* ! While the present generation takes the hauling power of a 3½-in. gauge engine as a matter of course, they don't realise that it was the smaller fry that really started the ball rolling, and are inclined to disparage their power. I wouldn't mind betting that those good folk who are building *Netta* in 2½-in. gauge, will be surprised at what she can shift. Time proves all things !

Tail Lamp

Before saying "bye-bye" for another week, just a word about the picture gallery. The *Britannia* locomotive was built by the before-mentioned Bro. Negrete in Buenos Aires, and she's not the only one, by long chalks, who was " born and raised " far away from her homeland. Our worthy Argentine brother also took the shot of a full-sized engine being erected at the Vulcan Works, which is interesting, as emphasising the vast difference between putting up a real " Bill Massive " job, and the small edition which takes shape in your home workshop. Yet they do it just as easily ! Now, will those of our fraternity who have worried me to describe a super-powerful simply-built 0-6-0, to run with heavy loads at fetes and similar functions, and also capable of running around very sharp curves in small back gardens, please take a good look at the picture showing the industrial American switcher ? She fulfils the above conditions, also the request for an engine that is " a little different." If approved, and our friend with the blue pencil is willing, I could make a simple and easy job of her, without sacrificing any of her characteristics, in a short serial to follow the *Tit*. It's up to you !

SMALL GENERATING PLANT PROBLEMS

(*Continued from page* 314)

will be a comparatively low value, the starting current could be as much as twice to three times its normal load demand. It would be of no avail to use a fuse for the rated load of the motor, because it would fuse before the motor even got going. Here the fuse would have to be sufficiently large to cater for the starting current, and these conditions would have to rule; even in this case, it is difficult to decide the correct size of the fuse wire, because you might be starting on no load or light load; on the other hand the motor might be called upon to start against a heavy load, therefore the fusing decision must be on the merits of the individual case. There are types of motor starters specially made for cases like this; with heavy fuses provided in the starter that take charge of the starting currents; but, when the motor is up to speed, the correct size fuses are inserted in the motor circuit; this operation is, of course, done automatically by the action of the starter switch.

Hints on Marking-out

By "Duplex"

WHEN bolting one component to another, the obvious and most accurate way of ensuring that the bolting holes are correctly spaced and positioned is to clamp the two parts together and then drill through both, or one part can be drilled first and then clamped to the second so as to form a drilling jig or guide.

However, it is not always possible to employ these methods and, instead, accurate marking-out has to be relied on ; but if this is

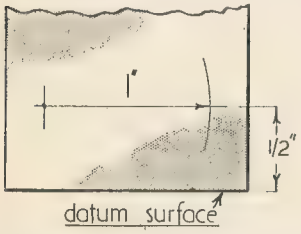


Fig. 1. *Marking-out the centres of two bolt holes*

at fault, the bolt-holes will have to be drawn over by filing to correct any bad workmanship.

If the dimensions marked-out on one part are to be accurately transferred to a second part, it is essential to make proper use of the ordinary marking-out tools.

Where, as in Fig. 1, the centre-line of the bolt holes is scribed at an exact distance from a datum surface by means of the jenny calipers, these calipers are set to the given dimension by holding the scribing leg firmly in the corresponding graduation on the rule, and then carefully closing

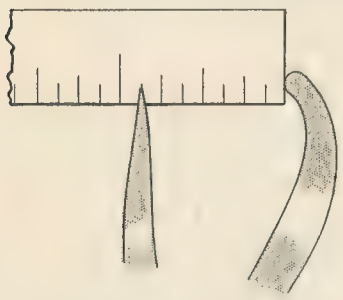


Fig. 2. *Setting the jenny calipers with the rule*

the guide leg against the end of the rule. As a check on the setting, hold the rule against the light and make sure that the guide leg remains in contact and has not sprung away. If this test does not prove satisfactory either the pivot joint requires attention or calipers of better quality are needed. In this connection, the rule kept for marking-out should have its zero edge carefully preserved and not used as a scraper for cleaning off paint or dried oil.

If the two components are to be aligned from their edges, a centre-line is now scribed on the second part with the calipers kept at the initial setting.

Spacing the Bolt-Holes

The centre of the first bolt-hole is marked on the scribed line with a sharp centre punch. When doing this, it is advisable to use a hand-glass to set the punch point exactly on the line, although the point of a really sharp punch can usually be felt to engage in even a lightly-scribed line, provided one has a delicate sense of touch.

The centre of the second bolt-hole is now marked-out from the first with the aid of the dividers. To set the dividers to an exact dimension, both points should be engaged simultaneously in the corresponding rule graduations. Correct engagement can be checked by first pressing on one point and then on the other ; if the points are not properly seated in the graduations, the calipers will then be felt to move slightly sideways or even to click into engagement. When marking-out with either the jenny calipers or the dividers, only light pressure should be required to form a clearly scribed line ; but for this purpose the points must be kept really sharp. Detachable points, made of round material, have the advantage that they can be quickly and accurately sharpened with an oilstone slip when mounted in a high-speed drilling machine.

The second bolt-hole centre can now be marked-out on both components from the first punched centre and, if the centre-punch is again accurately applied, the drilled bolt-holes should line up correctly.

However, the punch marks should always be enlarged with a centre-drill before the clearing-size drill is

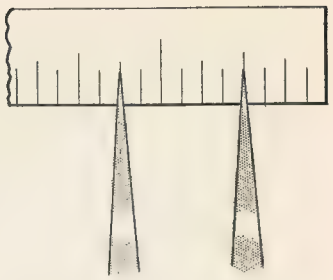


Fig. 3. *Setting the points of the dividers in the rule graduations*

entered ; otherwise, the flat at the end of the drill point may run away from the small centre mark formed by the punch.

When spacing two or more gear wheels and other parts of this kind, where the running centres must be set at an exact distance apart, the bearing for one wheel is first marked-out and machined, and the bearing for the second can be accurately and conveniently located by means of a toolmaker's button of the form illustrated in Fig. 4.

Although sets of hardened and ground buttons can be obtained from the tool merchant, these accessories can be easily machined in the lathe, and there is no need to harden them,

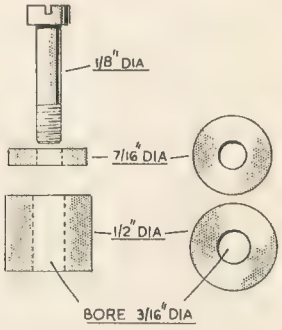


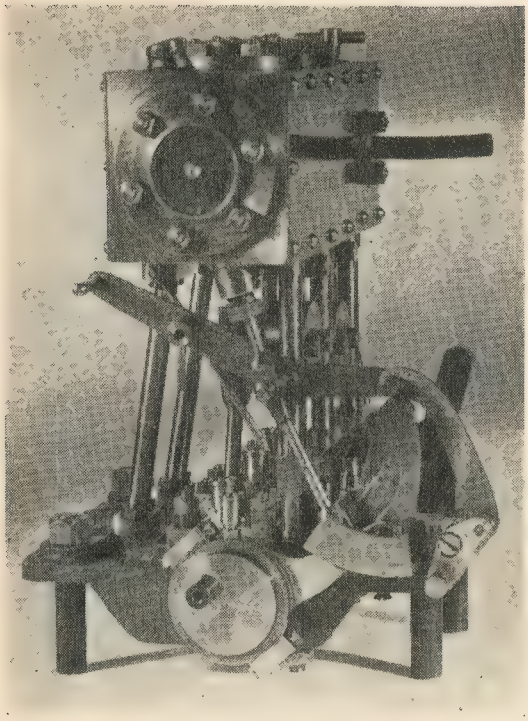
Fig. 4. *The components of a typical toolmaker's button*

as in the small workshop they are hardly likely to become worn. Chuck a short length of mild-steel rod ; face the end and turn the rod to a close working-fit in the bore of the second gear wheel. Drill the work axially, say $\frac{1}{16}$ in. larger in dia. than the fixing-screw decided on ; then part off so as to make the button a little longer than the bore of the gear wheel. A thick washer is next machined to fit the screw, but the dia. must be made about $\frac{1}{16}$ in. less than that of the button.

(*Continued on page* 323)

A LAUNCH ENGINE WITH MARSHALL GEAR

By G. Lindsey



Front end view

MANY years ago I built a model steam boat; much more recently, my son, C. H. Lindsey, who is Hon. Sec. of the International Radio Controlled Models Society, has used this boat as a "guinea-pig" in his experimental work. It had, however, one serious disadvantage for this purpose, the engine had only one cylinder, and consequently, starting, stopping and reversing were impossible. A successful speed control was fitted, and this served for a time.

In a rash moment I undertook to make a new two-cylinder engine. As I am at present engaged on an old-time locomotive which is likely to take quite a long time, even without interruptions, I visualised the simplest possible job, occupying two or three months at the outside. Actually, the engine about to be described has taken over twelve. This was partly due to the fact that as I get older, I become more and more particular about accuracy and finish, and so turn out less and less. The main trouble, however, was that Mr. Tucker gave the Stockport S.M.E. a pre-exhibition view of his wonderful triple-expansion launch engine. Now I have always had an ambition to model a real marine engine, but the enormous amount of work involved has put me off. Mr. Tucker's choice of a small prototype opened up new possibilities, and I began to think of a small compound launch engine made by W. Sissons & Co. Ltd., of Gloucester, in the South Kensington Museum. This has always fascinated me, on account of its unusual gear, which is Marshall's variation of the Hackworth gear. I decided that nothing less than a model based on this engine would satisfy me. I say "based on" because it was essential for our purpose to have a simple instead of a compound, so as to guarantee starting. After some consideration, I decided against camouflaging the engine to look like a compound. I do not know whether Sissons ever made simple engines, but I do remember seeing such engines of other makes on the Windermere steamers, before they were replaced by diesel engines. For the sake of neatness, I did follow the compound in one respect, in only having one steam inlet and one exhaust, and thus avoided external pipes. The connections are made by copper tubes soldered in place underneath the lagging. At this stage, I might mention that the small screw-down valve on top of the cylinder block is a substitute for a drain cock. When it is open, steam can blow through both steam chests and out at the exhaust, thus warming up the cylinders, and getting rid of much condensate. Apart from position, it is not unlike the simpling-valve in the prototype.

The first step was to obtain some particulars. Fortunately, the Museum authorities are able to supply excellent 10 in. × 8 in. photographs of most of the exhibits, at the very modest price of 2s. post free. About this time, I had to go to London on business, and managed to fit in a short visit to the Museum. I made various sketches, and took such measurements as were possible outside the glass case. The following particulars were also available:—

Cylinders: 5½ in. and 8 in. × 5½ in. stroke.

480: r.p.m.

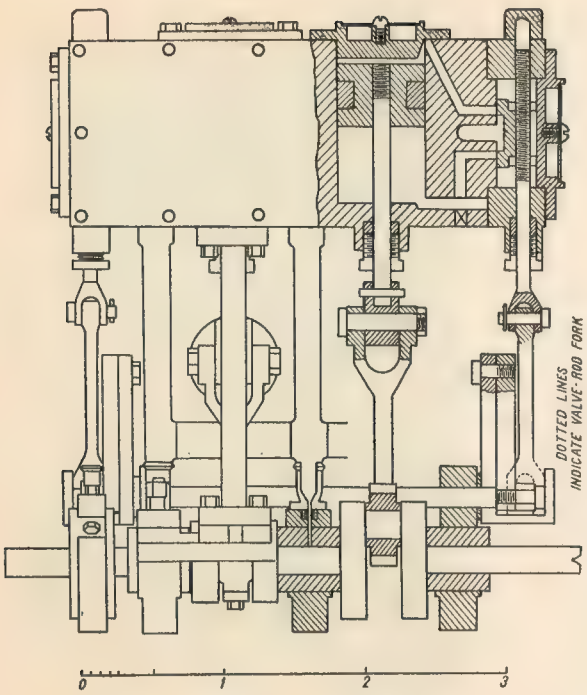
H.P.: 30 at 150 lb. per sq. in.

Apparently the engine was non-condensing. I decided to work to a scale of about ¼, the bores to be ⅝ in., but owing to the necessity to use over-thickness pistons, and the desire to keep the height down, the stroke was reduced to ½ in.

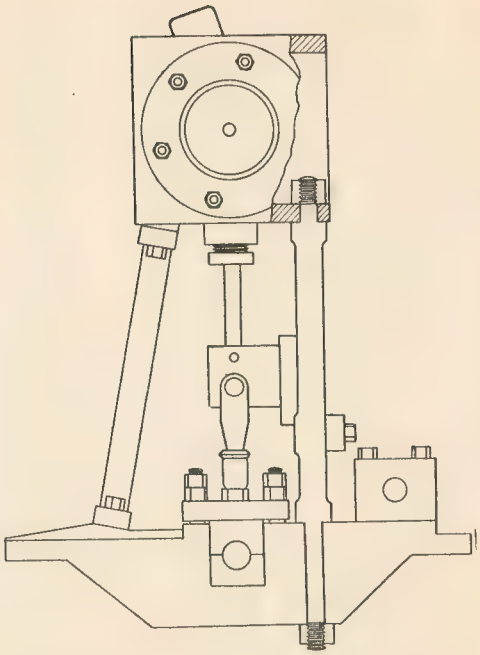
Now, like "L.B.S.C.", I dislike making drawings, but unlike him, I am apt to come unstuck when I try to do without. I contented myself with a non-detailed general arrangement drawing, and made dimensioned sketches of individual parts as I went along. I also attempted to estimate some measurements from the photograph—this was not a very successful policy. One result was that the crossheads fouled the bar which supports the lower ends of the guide bars, and this necessitated making three new columns.

Patterns

These were made for the cylinder block and bedplate, and castings obtained in gunmetal. As only one engine was being made, the patterns were very simple, and details such as the ribs on the bed, and also the removal of surplus metal from cylinder block, were done by end-milling. Fortunately, I had access to a small vertical milling machine. Apart from this, all machining was done on a 2 in. lathe and a small drilling machine.



Part sectional view of starboard side



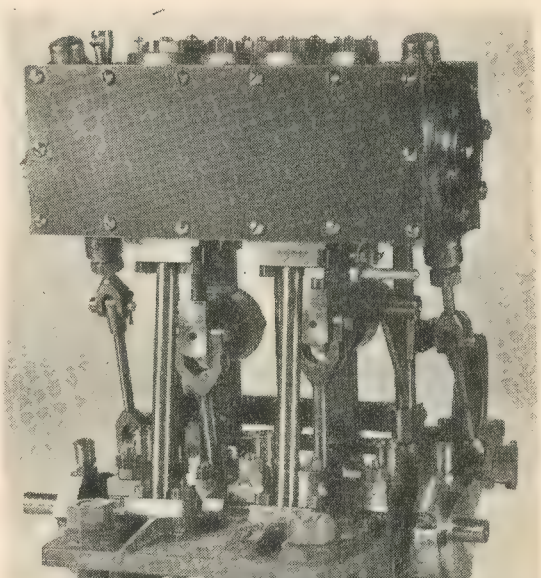
Front end view with valve-gear removed

As in the prototype, no bottom covers are fitted. Consequently, the lower steam passages had to be made by drilling holes at right-angles and plugging where necessary. The engine in the Museum has the steam-chest covers removed, so that the valves and ports can be seen. The ports are at right-angles to main piston-rods, not to the inclined valve spindles. They are arranged in echelon.

Mostly Turned Work

In the model, advantage was taken of the round covers to adapt the design so as to do most of the work by turning. Separate steam chests are used, and these are spigoted on to round valve faces. The ports are curved, and were cut by end-milling in the drilling machine, using a radius bar centred in the drilled exhaust ports. The valves are round, and are free to turn in round buckles. No doubt, Inspector Meticulous will point out that the radius of the valve exceeds that of the outer edge of the ports by the amount of the lap, and consequently the ports cannot open simultaneously along the whole length. I admit this, but the error is small compared with the fineness of adjustment possible with a valve spindle screwed 48 t.p.i. In larger sizes, it should not be difficult to devise a method to cut the ports to the correct radius. Both the valves and pistons are cast from car piston metal.

The valve-gear was one of the most interesting parts of the job. I started by making a large scale "mock-up" so that I could study events. It was found that a close copy of the original proportions gave too early a cut-off to guarantee easy starting, in the absence of an engineer at the reversing lever. The valve-rod, therefore, had to be connected nearer to the swinging link. This restricted still further the small amount of room available for the bits and pieces. The swinging link, being shorter than the valve rod,



Starboard side of engine

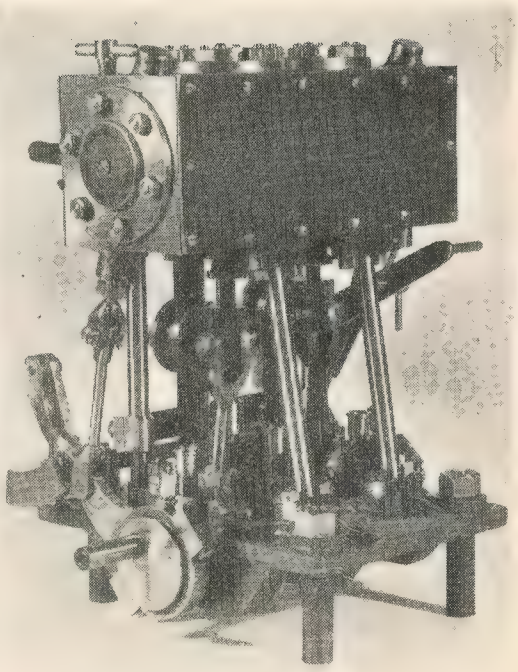
introduces similar errors (but the other way about) to the straight slide in the Hackworth gear. This is not of great importance in a marine engine, as the distribution in one direction is quite good, and this can be used for ahead. The unequal port opening in reverse does not prevent starting. The only critical measurement is the length of the eccentric-rod. This problem was solved by making an adjustable one and using it as a jig.

The first crankshaft was built up and silver-soldered, but after the bits of shaft between the webs had been cut out it was found that one crank-pin was loose. This was probably due to insufficient heat in an endeavour to prevent scaling. The present shaft is cut from the solid, and as the diameter is only $\frac{3}{16}$ in., this was rather a delicate operation, but the result was satisfactory.

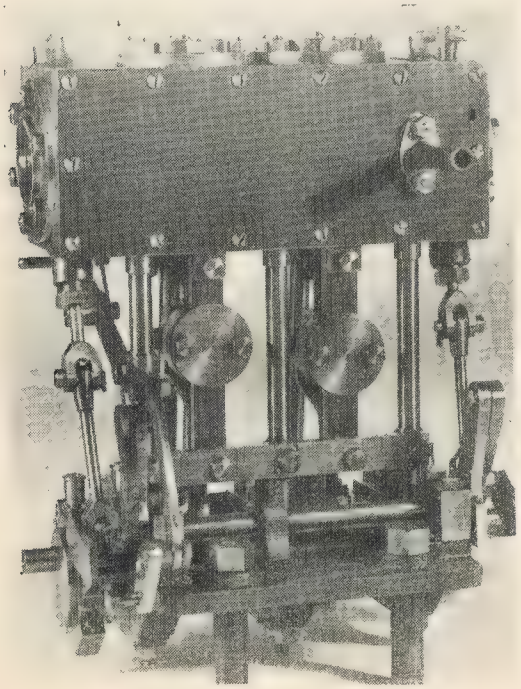
The connecting-rods were made in pairs from $\frac{5}{8}$ in. square bar. The holes for the gudgeon-pins were first drilled, and then a slot was end-milled right through the bar to form the forks. The bar was then chucked, and the rectangular parts machined, after which the round parts were turned between centres. At the third attempt, a satisfactory pair were made. The rounded ends to the forks were filled with aid of hardened buttons. Apart from this, all the shaping was done by turning.

In the course of construction, many cases arose where it was necessary to drill parts exactly in the middle and also to space the holes accurately. As there are probably many others like me who have great difficulty in centre-popping just in the right place, it may be of interest to describe my method of making jigs.

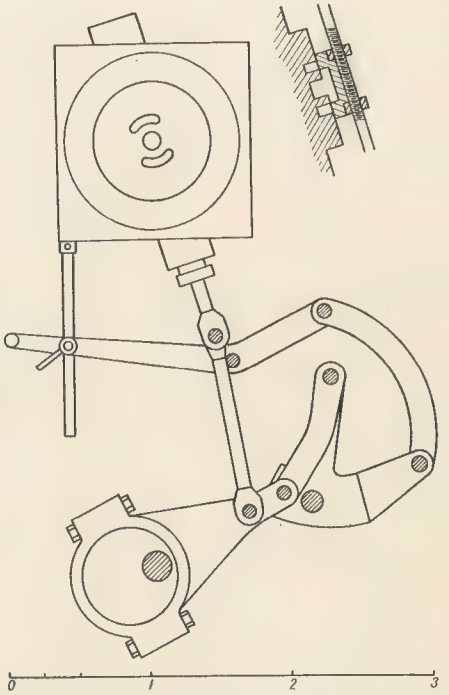
The three bearing caps provide a good example. These are made from $\frac{5}{16}$ in. $\times$ $\frac{1}{8}$ in. mild-steel, and each has two holes



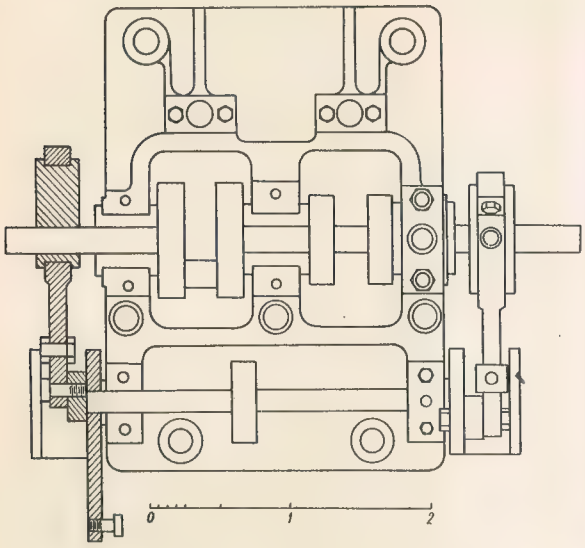
Rear end view



Port side, showing weight shaft



Front end view of valve-gear in ahead position. Rotation, anti clockwise



for the bolts and one for the lubricator. Take a piece of metal, preferable brass, about 1½ in. × ½ in. × ½ in. and mount it on the cross-slide, with its middle at centre height. Put a $\frac{5}{16}$ in. end-mill (mine was made from old $\frac{5}{16}$-in drill) in the chuck, and mill a groove the full 1½ in. length and about ⅛ in. deep. Then replace the end-mill with a centre drill, and with the aid of the cross-slide index, drill three holes at the desired centres. The jig will also come in useful any time a central hole is wanted in $\frac{5}{16}$ in. wide material.

In conclusion, I am pleased to say that the engine performs well under steam, but it has not yet been tried out in the boat. There still remains the steam and mechanical side of the control for me to complete, before I hand it over to the radio department.

The photographs were taken by my friend, Mr. A. Eastham, and were the first taken with a studio camera he has recently constructed.

Left : Plan view of bed-plate

Hints on Marking-out

(*Continued from page* 319)

After the centre for the second gear wheel has been marked-out as accurately as possible, and then drilled and tapped for the fixing-screw, the button, with its faced end downwards, is lightly secured to the surface of the work. To enable the button to seat truly, any burrs set up on the work by drilling and tapping must be removed with a scraper. After the gear wheel has been mounted on the button, so as to mesh with the first wheel, the assembly is lightly tapped until the two wheels are found to run correctly in mesh ; the button is then secured in place by tightening the fixing-screw.

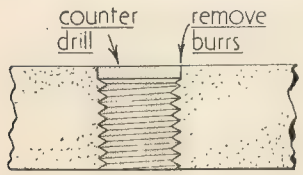


Fig. 5. Preparing the work for mounting the toolmaker's button

The work, with the button still in place, is now mounted in the lathe and the button is set to run truly with the aid of the test indicator. Should the clamping bolts or other parts get in the way when bringing the plunger into contact with the button, this difficulty can be overcome by fitting the test indicator with its reverse attachment. After removing the button, the bearing or bearing housing for the gear wheel can be machined, with the knowledge that it will be accurately located to ensure correct meshing of the two gear wheels. Moreover, any number of additional gear wheels can be located by using the same method.

Care must, however, be taken when enlarging the hole for the fixing-screw to the size of the finished bore, for the screw hole will probably be out of centre and, although it may be possible to drill out the hole, the final machining must be carried out with a small boring tool.

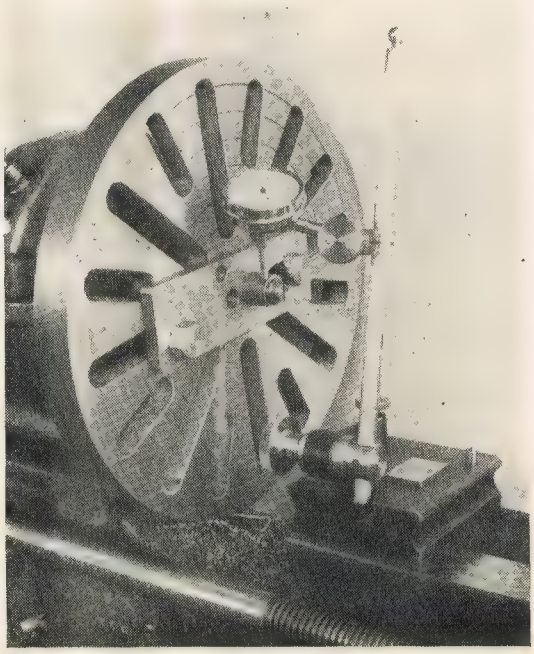


Fig. 6. Using the test indicator for centring the button

READERS' LETTERS

Letters of general interest on all subjects relating to model engineering are welcomed. A nom-de-plume may be used, but the name and address of the sender must accompany the letter. The Managing Editor does not accept responsibility for the views expressed by correspondents.

S.A.R. LOCO. LIVERY

DEAR SIR,—I am at present engaged in the building of a 3½-in. gauge version of the South African Railways " 15F " heavyweight, guided by the excellent drawings of Craftsmanship Models Ltd and also by the hand-book published by the " *Railway Gazette.*"

I have, however, failed to secure details of two features which I fancy are important enough to merit research, namely : which crank leads, and what is the colour scheme ?

It is my intention to paint as I build and so details of frames, wheels, stretchers, etc., are of most immediate importance.

For passing interest, the frames were hewn from the solid steel bar, but I consider the result has well justified the effort. For the leaf springs, which are universally employed on this locomotive, I found that worn-out bandsaw blades are unexcelled, although blued baling strip runs it a close second.

I have, in the course of experiment, evolved a method of trimming to breadth, which ensures straight edges and uniform breadth and does not demoralise the grinding-wheel.

If there is any other reader engaged on the same project, I shall be glad to hear from him to exchange views, pet theories or encouragement.

Yours faithfully,
Belfast. R. B. BEGGS.

THE ENGRAVING MACHINE

DEAR SIR,—I have been interested in the description of the engraving machine described by " Duplex." At one stage of the war, it fell to my lot to use one of these machines a considerable amount.

There is no doubt about their versatility, as for decorative work quite simple and effective stencils can be made out of tinplate or even thin plywood where only a few off are required.

As regards the cutter grinding, it is quite possible to hand-grind the clearance, much as one would touch up a drill ; but it needs care, as too much will tend to make the whole pantograph assembly shudder, as the cutter tries to " draw in " to the cut. Some materials, such as cast gunmetal, usually do not need much clearance, but sheet brass will usually need a little more. As " Duplex " rightly says, the face of the cutter must not be ground back. A well-sharpened cutter will mill a clean groove.

A big help on this type of machine is to have a means of raising and lowering the main table. With the cutter head led down to its stop, the depth of cut is put on by raising the table. The cutter head is then raised up at the completion of each stencil, and fed down again for the next, so making an even depth on each character.

Anyone making one of these machines would be well repaid for their trouble ; but, please, don't overload it by trying to remove metal too fast.

Keep up the good work " Duplex " ! Everything is drawn and described to perfection.

Yours faithfully,
Maitland, N.S.W. R. BROWN.

CASTING PADDLE WHEELS

DEAR SIR,—I note that in a recent article describing an old-time paddle engine, it is stated that the paddle wheels are cast, and this is described as a difficult job for the foundry. This kind of casting, however, is by no means uncommon in engineering practice, and it can be done by moulding in a three-part box. The pattern is made in two parts, one side having the floats attached to it and registered, but not fixed, to the other side.

Any competent moulder should be able to produce a casting from a suitable pattern, by this method.

I may mention that I am over 80 years of age and have been a pattern maker for many years.

Yours faithfully,
Calne. G. FARMER.

TANGYE ENGINES

DEAR SIR,—Readers might be interested to know that there is at least one girder-type engine still at work in Birmingham at Messrs. Thomas White in Hertford Street, driving wire-drawing machinery.

It bears the legend " Tangye Birmingham ' 20 ' × ' 40 ' " cast on the girder bed. The flywheel is about 10 ft. in dia. cast in two halves, and would weight about 9 tons, said to develop 100 i.h.p. at 65 r.p.m. The engineer in charge of it told me it was installed as second-hand reconditioned engine in 1912 !

Damaged in the recent world war, Tangye's made some new parts, including a new flywheel, by copying the damaged parts, as no plans or records of the engine existed, and only three engines of this type are known to be in use.

Yours faithfully,
Streetly. E. H. WARRENDER.

SILENCERS FOR MODEL POWER BOATS

DEAR SIR,—At a recent committee meeting of the Victoria Model Steamboat Club, it was decided that in view of the total disregard shown by competitors of the *effective* silencer clause laid down by the L.C.C., some definite action should be taken. With this in mind, a sub-committee was formed to stop any boat from running that contravenes this clause. This included both round-the-pole and straight runners.

Whilst this decision was taken with reluctance, the M.P.B.A. members will, I feel sure, agree that it is necessary if we are to continue to operate at Victoria Park.

Yours faithfully,
Enfield. E. E. WOODLEY, *Hon. Sec.*

Next Week . . .

MILLING DRIVE PROBLEMS

A motor driving unit for the lathe milling attachment is described by " Duplex."

STEAM TURBINES

The construction of the simple geared impulse turbine, with pros and cons of different constructional methods.

A SUPERCHARGED PETROL ENGINE

Mr. B. Stalham describes the design and construction of his unique Vee-twin o.h.v. engine, with rotary blower for forced induction.

" NETTA "

The 2½-in. gauge version of this engine is large enough for a proper valve-gear which " L.B.S.C." describes and illustrates.

" TWIN SISTERS "

A water-gauge suitable for these engines is fully dealt with.

WITH THE CLUBS

Society of Model and Experimental Engineers

On Saturday, September 11th, 1954, at 2.30 p.m., at the Caxton Hall, Mr. Bamford will give a talk entitled "Some Adventures with Flash Steamers," and to judge from articles Mr. Bamford has contributed to THE MODEL ENGINEER, the talk should prove most stimulating.

Visitors and members of other societies will be most welcome; and application to join the society should be addressed to the Secretary, 28, Wanless Road, S.E.24.

The North London S.M.E.

At the August general meeting, Mr. Brooks gave us a lively evening with a very detailed description of the club's new workshop in Prospect Road. Some of the work involved in dismantling the 12 h.p. gas engine and its disposal, caused considerable amusement.

Future events:— Exhibition at Ewen Hall, Wood Street, Barnet, September 28th to October 2nd.

Sunday, September 19th. Children's Day at the club's new loco track at Arkley for members' children and friends.

Monthly general meetings are held at the Eastern Gas Boards offices Station Road, New Barnet at 8 p.m., by courtesy of the Eastern Gas Board.

Hon Secretary: W. H. RANSOM, 6, Arundel Court, 127, Woodhouse Road, N.12.

The Guildford M.E.S.

The Annual Exhibition will be held this year on Saturday, September 18th, at St. Saviour's Hall, Onslow Street, Guildford from 10 a.m. to 9 p.m.

Models constructed by our members and friends will include railways, locomotives, ships, aircraft and general engineering.

The society's passenger-carrying track will be in operation for rides, throughout the exhibition period.

It is hoped to have working models, layouts and trade stands for those interested.

Refreshments will be available during the afternoon and evening.

Offers of exhibits and further details to the Secretary: V. H. R. SELLEY, 42, Raymond Crescent, Dennisville, Guildford.

The Kingsmere Model Power Boat Club

Our Annual M.P.B.A. Regatta will be held on Sunday, September 12th, at Rushmere Pond Wimbledon Common, commencing at 11 a.m. The regatta this year, will be for straight running boats only, and the programme will include, Nomination, Steering Competition, an event for Radio Controlled boats, and a club team race.

We have been allowed to hold our regatta at Rushmere, on the understanding, that there will be no excessive noise. Therefore to avoid any complaints, will all competitors please make sure that they have efficient silencers fitted?

Hon. Secretary: C. F. MORGAN, 134, Lavenham Road, Southfields, S.W.18.

York City & District S.M.E.

Meetings will be held at Rechabite Buildings, Clifford Street, on September 11th and 25th.

Track meetings at Bishopthorpe will be held on September 19th and 29th.

A visit by the society and friends is being arranged to Huddersfield Track on Sunday September 12th, leaving at 11 a.m.

Hon Secretary: W. SHEARMAN, 28, Terry Street, York.

The Tyneside S.M.E.E.

The next meeting will be on Saturday, September 18th, at 2.45 p.m., in the rooms of the Newcastle Photographic Society, 6, Rutherford Street, Newcastle-upon-Tyne. The purpose of the meeting is to complete arrangements for the exhibition. It is hoped that a large number of members will attend.

Hon. Secretary: L. JAMIESON, 34, Dorcas Avenue, Newcastle-upon-Tyne, 5.

The Wakefield S.M.E.E.

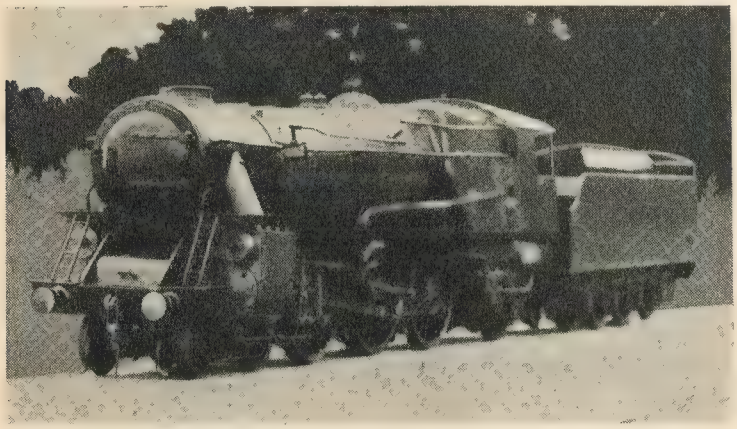
A meeting will be held in the R.A.F.A. Club Headquarters, Old Black Swan, Silver Street, Wakefield, on Wednesday, September 22nd, 1954, at 7.30 p.m.

"Finish on models and how to obtain it," a talk by Mr. L. R. Raper (member). Mr. Raper is a former "M.E." Championship Cup Winner, so this talk promises to be most instructive.

Visitors are welcome at all meetings.

A club loco in 5-in. gauge to Messrs. Kennion Bros.' "Butch" design, is being built by members, and it is hoped this will be ready for next season.

Hon. Secretary: J. S. JACKSON, Marlborough House, Headlands, Ossett, Yorks.



A 3½-in. gauge free-lance Pacific locomotive built by Mr. E. C. Hobday of the North London Society of Model Engineers. It is a really hard worker

THE MODEL ENGINEER DIARY

September 9th, 10th and 11th.—Northallerton & District Model Engineering Society.—Exhibition in the Town Hall, Northallerton.

September 9th, 10th and 11th.—North Wales Model Engineering Society.—Exhibition at the Town Hall, Llandudno.

September 11th and 12th.—The West Midland Federation of Model Engineering Societies.—Loco Rally at Campbell Green, Birmingham.

September 12th.—Kingsmere Model Power Boat Club.—Regatta at Rushmere Pond, Wimbledon Common, commencing 11 a.m.

September 18th.—Guildford Model Engineering Society.—Exhibition at St. Saviour's Hall, Onslow Street, Guildford. Open from 10 a.m. to 9 p.m.

September 19th.—Blackheath Model Power Boat Club.—Regatta at Princess of Wales Pond, Blackheath, S.E.3.

September 23rd, 24th and 25th.—Keighley and District Model Engineering Society.—Exhibition at the Temperance Hall, Keighley.

September 25th, 27th, 28th, 29th 30th, October 1st, and 2nd.—Southport Model and Engineering Club.—Exhibition in the Chapel Street Congregational Schoolroom.

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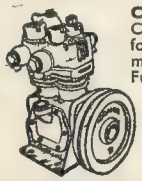

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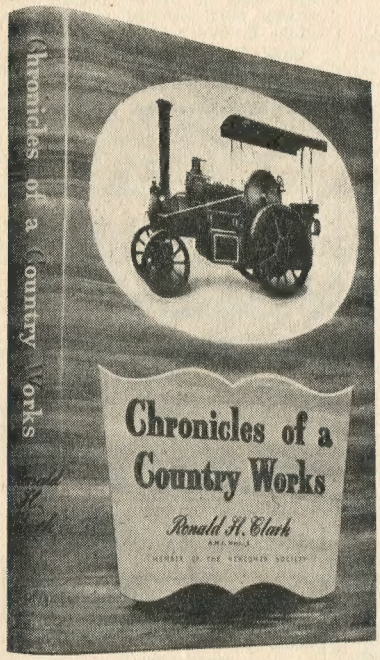

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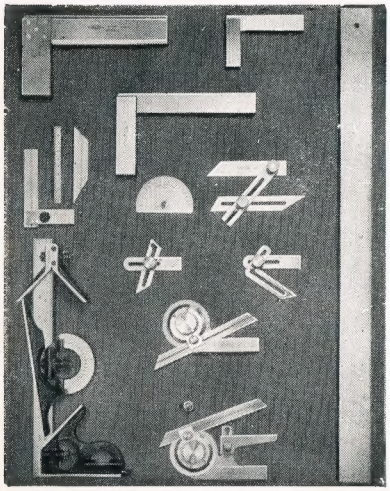

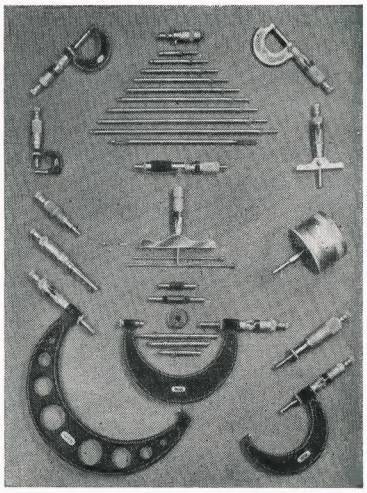

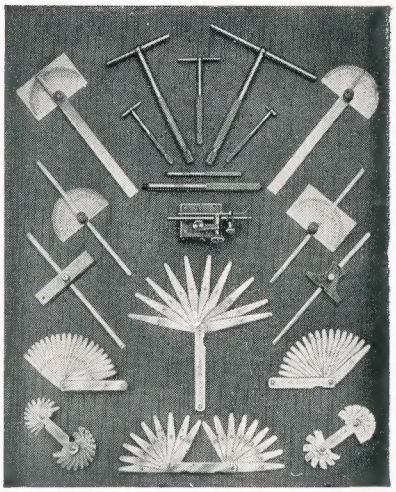

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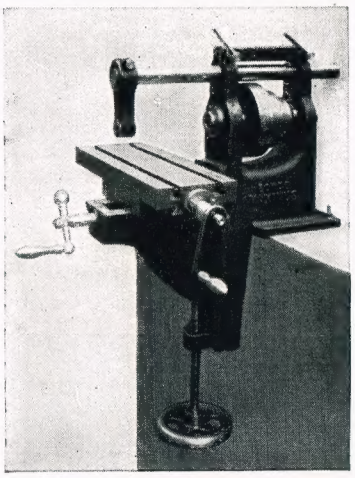

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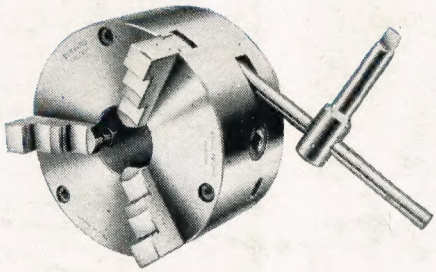

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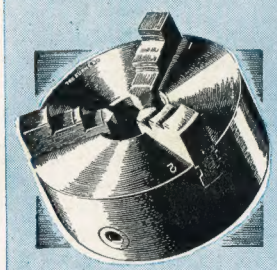

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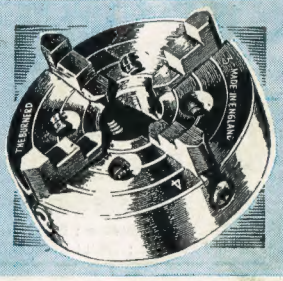

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